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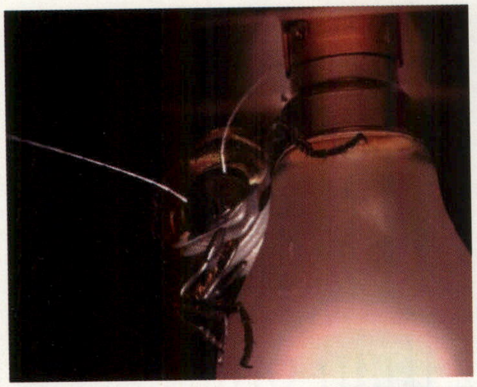
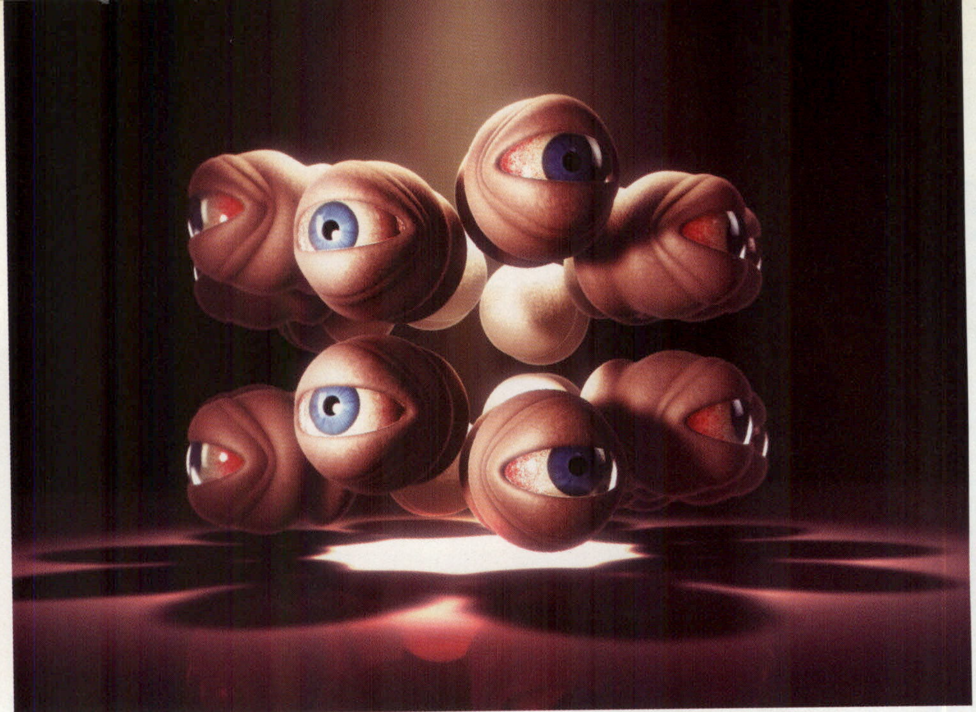
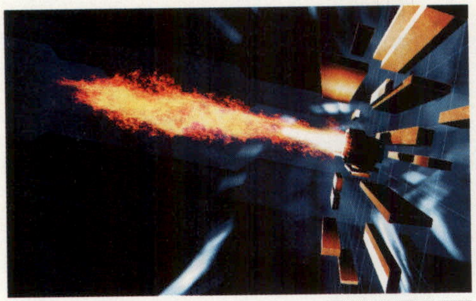


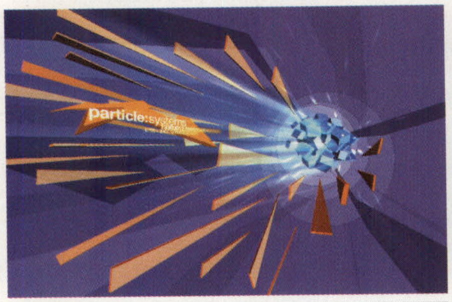
18 **Realise Studio**



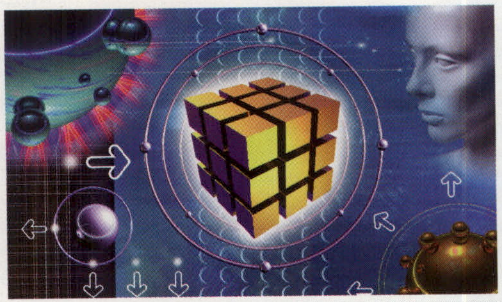
24 **Cinema 4D XL 6.1 tutorial**



44 **Graphics cards**



80 **Particles tutorial**



62 **Lighting explained**

Contents [14/12.00]

07 **CD Contents**
A guide to all the software and full programs and demos on our CD

08 **Intro to 3D**
With computer costs lower than ever and improved software, it's a great time to explore 3D

12 **Choosing your 3D software**
Choosing the right software for the job is essential. We help you decide which package suits you

18 **Realise profiled**
We take a look behind the scenes of the First Direct ad

24 **Cinema 4D XL 6.1 tutorial**
Create a simple eye that can be animated with the minimum of effort.

29 **Subscribe to Specials!**
Get every issue of *Computer Arts Special* for half price

30 **Rendering explained**
We explore 3D rendering and look at the tools and features needed to produce optimum results

36 **Renga Media profiled**
A look at the company whose style is manga meets 2000AD

38 **50 beginner's tips**
We've compiled 50 tried and tested tips to give you results

44 **Graphics cards**
Eight graphics cards to suit your needs and your budget

50 **Komodo profiled**
Find out what inspires and motivates this Californian-based 3D design company

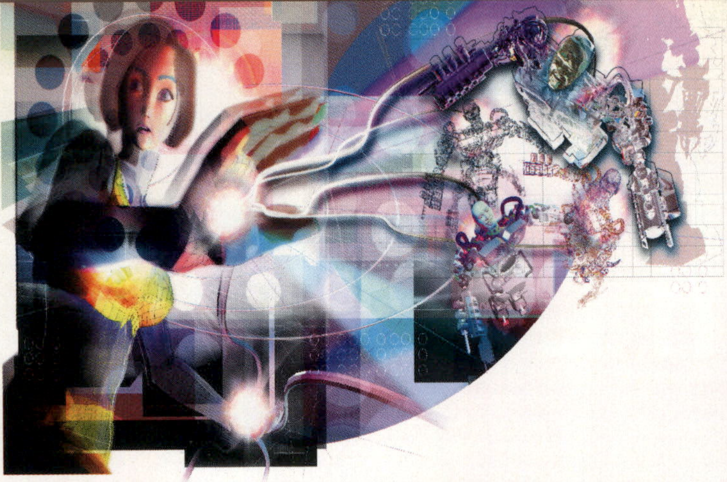
55 **Compo**
A chance to get your hands on *Cinema 4D XL 6.1* – a top-quality 3D package worth £1,395

56 **Pixels 3D tutorial**
Create a stunning sea creature using *Pixels 3D Studio 3.6*

60 **Subscribe!**
Subscribe to *Computer Arts* and take advantage of our special offer on *Computer Arts Specials*

62 **Lighting explained**
Getting the lighting right can make all the difference. We show you how to get professional results

66 **Strata 3D tutorial**
Achieve high-quality effects with this popular program – full program on the cover CD

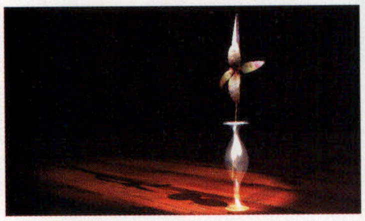


30 Rendering explained

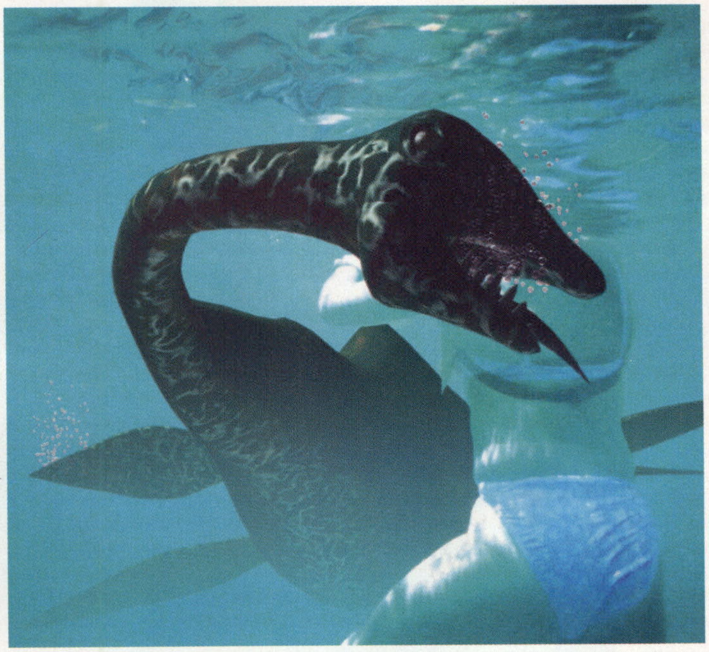
36 Renga Media

38 50 Beginner's tips

66 Strata 3D tutorial



72 Blender 2 tutorial



56 Pixels 3D tutorial

70 **Gwilym Morris profiled**
A profile of Gwilym Morris, this year's European Junior Animator

72 **Blender 2 tutorial**
Create complete 3D videogames without a single line of programming

76 **3D for the Web**
Programs and packages that may change your two-dimensional view of the Web forever

80 **Particles tutorial**
Create impressive natural-looking scenes with *Cinema 4D*'s Particle Emitter and modifiers

85 **3D books**
We review books on a huge range of subjects from lighting and rendering to building 3D scenes

88 **The best 3D Websites**
Plug into the 3D scene with our guide to the most innovative sites on the Net

92 **3D glossary**
We make your life easier by explaining all those 3D terms

98 **Next month**
100% Vector Illustration. Tips, plug-ins and tutorials galore!

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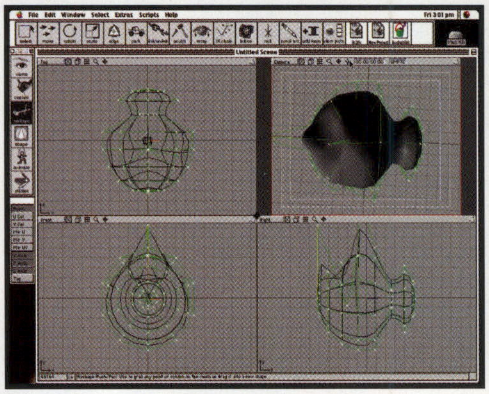

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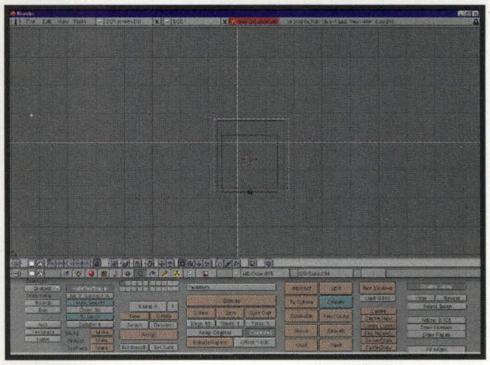
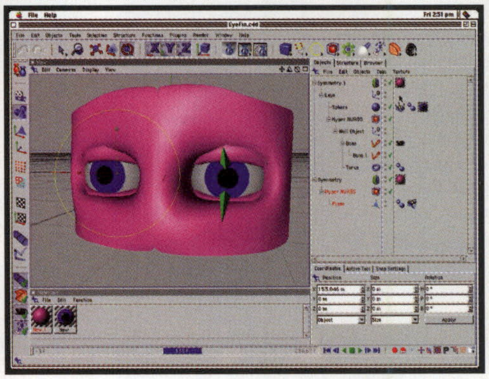


Cinema 4D XL 6.1 full program



Realise showreel

Movies

CDcontents [14/12.00]

Cinema 4D XL 6.1 full (dual)

Modelling, animation, lighting, texturing and rendering – all in a single neat package. Plus a very friendly interface that can be customised to suit your needs.

Strata 3D full (dual)

Packed with features and functions, *Strata 3D* delivers everything you can imagine to any medium you choose.

Pixels 3D 3.6.4 full (Mac)

Create a prehistoric sea creature with this versatile 3D package.

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Illustrator 9 (dual)

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Smells like Almonds 2 (dual)

A *Cinema 4D XL 6.1* plug-in. You can find it in the materials sections of *Cinema 4D*.

Tutorials (dual)

Complete tutorials that take you step by step through the latest 3D techniques.

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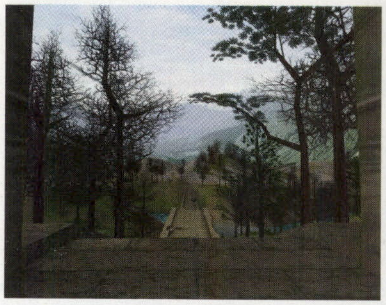
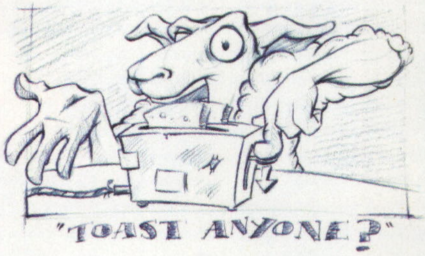
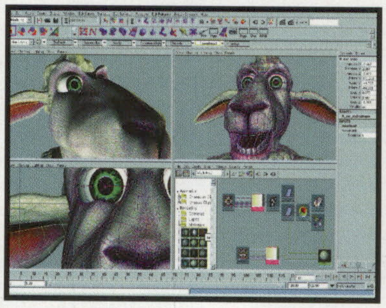
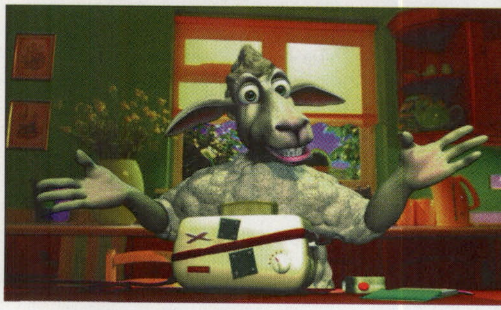


Once you get into 3D you'll find all sorts of outlets for your talent, from designing characters and landscapes for real-time 3D use in games like *Unreal 2* (above), to TV projects like the *Action Man* series animated by Mainframe (right).

Aardman is best known for its 'claymation' animation. This sequence shows the evolution of its sheep character for the Co-Op, from storyboarding to the final rendered image.


"TOAST ANYONE?"





HR3D's orang-utan gets to play Twister in this TV advert.

New dimensions

If you're champing at the bit to know more about 3D, then our special issue is essential reading...

Ever since 1958 when the term 'computer graphics' was coined by a Boeing engineer needing a visual display for his hard work, artists have been pushing the boundaries of what was possible with computers.

From the earliest monochrome screenmodes only capable of displaying a few blocks of black or white, to the more recent explosion in colour and screen resolution, people have been using 2D painterly techniques to recreate their work on screen.

However, while these 2D computer art techniques have been developing since the mid-1960s, people have also been trying to create 3D art on screen. Not just the kind where you sit looking silly wearing 'special' cardboard glasses while a blurry monochrome image leaps out of the screen at you, but the more complicated business of manipulating objects with depth as well as height and width, and positioning them to make a pleasing composition.

Unfortunately, until as recently as the mid-80s, this was a tricky process requiring a massive amount (by the day's standards) of power and a degree in higher maths. As computer costs have dropped and software has improved, more and more people have started to explore digital 3D.

Unlike 2D art - which is flat and familiar, whether created on a computer or with a palette knife and a set of oils - 3D art is a new field and we're only now starting to learn its dimensions.

This didn't stop companies like Disney investing a fortune in the development of computer systems throughout the 80s and the rise of Industrial Light and Magic - a simple effects house founded to work on a little movie called *Star Wars* - from rising to become one of the pre-eminent computer graphics houses in existence today.

Every year, the tools that companies like ILM, Digital Domain, Pixar and others dream into existence are translated into actual software for use by the masses. Before you know it, there they are on the high street, neatly packaged, ready to jump into your shopping trolley.

Audio Motion and Clear Motion captured Robbie Williams in order to have him strip to the bone for his *Rock DJ* video.

> "The more impressive your results, the more addictive the process becomes"

For this reason, among others, a new *Computer Arts 3D Special* is long overdue. *3D World* exists to inspire high-end users with tutorials and reviews, and *Computer Arts* covers 3D within its pages, but what about 3D for those not employed in the film industry who are more interested in the topic than the space in *Computer Arts* allows?

It's a question many readers of these very magazines have asked and so we felt it was about time we did one. After all, Future's watchwords are 'understand your readers' needs and fulfil them'. As such, this *Computer Arts 3D Special* is designed to get you into the swing of things.

Even if you haven't yet caught on to 3D – you just mistook this *Special* for an issue of your regular dose of *Computer Arts* – take a moment to delve within. 3D is one of the most exciting fields in computing, from its use on the biggest of screens to the simplest of animations, from London-based Eye's work on Cyberworld (coming to an Imax screen near you) to work you can see at other online movie houses.

While initially difficult to get to grips with, the effects you can achieve with 3D are limited only by your imagination. Want to ride from the tiniest cells in the brain out to the surface of the skin? Do it. Want a bunch of great apes playing Twister in the jungle? Go right ahead, other people have.

With computers getting faster and faster, feature films generated completely by computer will become more commonplace than one every two years from Pixar. Some will be generated by artists (or, more likely, teams of artists) not yet famous. You could be one of them; all you need is a bit of vision and an average machine.

Just the beginning

Space scenes and other effects from *Babylon 5*, Channel 4's hit sci-fi series, were all rendered on machines much like the one you've got. You don't need special hardware to get started, just a willingness not to settle for the clichéd image of a chrome ball on a chequerboard backdrop.

One thing about 3D is that you'll probably never find a field in computing that has more jargon. This can be daunting to start with until you realise that no existing terms adequately describe what 3D does – a whole new vocabulary is called for.

When you start, you're likely to be confused by such things as vertices, non-planar polygons and spline cages. When you graduate to high-end software you have to deal with things like caustics, radiosity and subdivision surfaces. That's just the beginning of a long list of tongue-twisters, but you'll need to get to grips with them to describe the behaviour of the camera, lights and objects in your scenes as they grow more and more complex.

If you're comparing 3D with a real world activity, then photography is probably the closest analogy. As in 3D you start by taking simple pictures, with a simple camera. Just push the button and admire the simplicity of what you've done.

Then your ambitions start rocketing – you want filters and a decent flash and the equipment gets more complex. To achieve respectable results you can't rely on having an autofocus function on your camera and, what's more, you need a tripod, goddammit. And then, you want to get into motion.

The same is true of 3D. A nice simple package like Bryce is a good one to start with. It's fun to get into and you can achieve some good-looking results without much effort. After which, you can start to push the boundaries a bit... You'll soon realise that while Bryce is a fantastic bit of software, it does have certain limitations, at which point you'll probably move on to *trueSpace* or *Cinema 4D Go*.

The fun doesn't stop there. Once you've got the hang of modelling in all its varied guises, you'll need to create texturing to bring it alive.

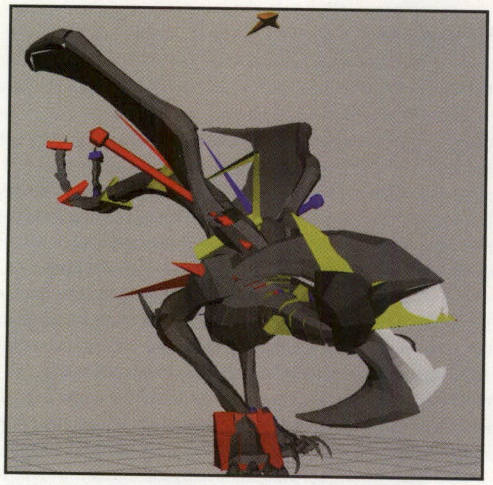
This means getting to grips with paint packages and procedural textures. You'll learn about planar, cylindrical and environment mapping. Then the fateful day arrives when a heavyweight package like *3D Studio MAX*, *LightWave* or the grown up XL version of *Cinema 4D* lands on your doorstep and there's loads more tools at your disposal.

But wait! Although you've got a nice new model with its Sunday best textures on, you need to learn about lighting, camera motion, inverse kinematics and more.

As with the camera, you'll want to investigate depth of focus and work with motion blur, anti-aliasing and volumetric lighting. It doesn't stop there though... The best thing about 3D is that there's always something more to learn and new techniques to improve your pictures.

The more impressed you are by your results, the more addictive the whole process becomes. Anyone can be a 3D artist – get started today.

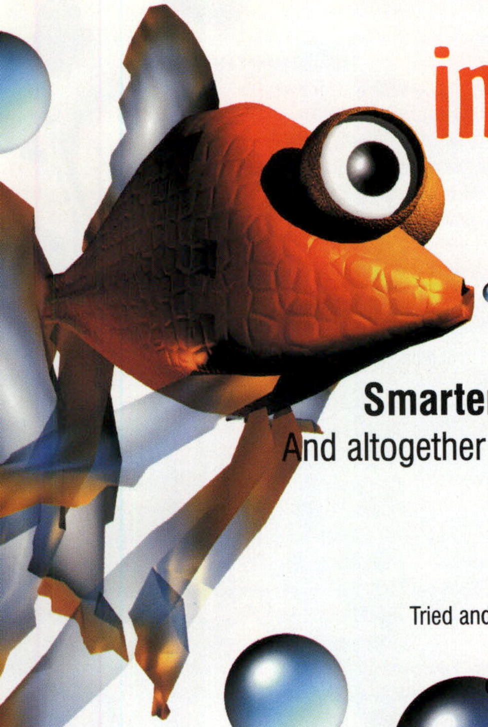
In the dark



Double Negative scripted in *Maya* to give animators unfamiliar with the way *Maya* worked an easy interface for animating the creatures.

Sometimes effects for movies seem to get left on the shelf for a while. Universal's new film, *Pitch Black*, which opens in the UK on 10 November, has been in the can for well over a year now. It's a great science fiction action film along the lines of *Aliens* or *Event Horizon* and its special effects were the responsibility of Double Negative's Paul Franklin. "We've been using *Maya* since version 1: we were all *Alias Power Animators* users before that. We started development on *Pitch Black* about the time that Maya 1.0 shipped so we were learning it as we went along." To give you some idea of the lag involved, *Maya 3.0* has been shipping for over six months now. Double Negative's work was on the alien creatures involved. Originally envisioned by well-known designer Patrick Tatopoulos as elegant animals, they gradually mutated into the kind of prowling predators that inhabit nightmares. Even with over 250 effects shots, the film is still one of the lowest budget sci-fi films this year, coming in at less than $25m.

Breathe Art into your Life...



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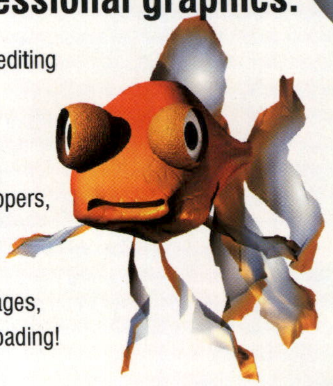

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Choosing 3D software

If 3D is all about problem solving, you need to know which 3D packages have the solution to your particular conundrum, whether you're creating simple flying logos or more complex character animations....

The world of 3D can be daunting, especially if you come from a purely 2D background. Over the years, 3D applications have become much more powerful but they have also become much easier to use so there's no need to be a maths graduate if you want to create stunning 3D imagery. With today's fast processors and 3D programs, anyone can create great 3D in a few hours or even minutes.

Though 3D programs come in all different shapes, sizes and prices, they set out to accomplish the same thing – a decent 2D image or animation. Some programs can control external machinery such as industrial lathes or special prototyping equipment and produce a real, tangible 3D object but by and large, what we're talking about is simply an image or a movie.

There are five main sections to a 3D program: modelling, texturing, lighting, animating and rendering. While all of the 3D apps in our round-up enable you to animate, some 3D programs can only produce still images, though these days they are becoming few and far between - almost all 3D apps enable you to animate to some degree or another.

Modelling is where you begin. You create your 3D models, building them from simple 3D shapes called primitives or by using more complex procedures. The greater the number of modelling tools in a 3D package the better, because 3D is all about problem solving, and the more tools you have at your disposal, the more likely you are to find the right one for the job.

The geometry from which 3D objects are constructed also varies from package to package. The most basic type of geometry is the polygon. A polygon is defined when three or more vertices (points in 3D space) are connected with edges. Some programs can utilise one and two point polygons, but generally you need three vertices to make a polygon.

Polygons can be connected to other polygons to form a surface mesh in the shape of your object, but defining the locations of points by hand and then joining the dots is laborious. Most 3D apps speed the creation process by deriving 3D shapes from simple 2D profiles. Take a circle and extrude it and you have a cylinder: sweep it around 360 degrees and you have a torus.

Polygon modelling is flexible and allows for very fine control over small areas of the model because you can select and move individual vertices. The problem with polygons is that you need quite a few to disguise the faceted nature of the surface. While the result is a smooth, curved surface, the object becomes harder to edit because there are so many points.

Enter NURBS. NURBS are a special geometry type which can create smooth flowing lines and surfaces but use very few points to define them. This makes editing objects easy since the smoothness of the surface is not an issue. Because of this NURBS are ideal for creating organic forms such as car bodies, characters and the like. However, they require a different set of tools to the ones required for polygon modelling. Certain shapes are difficult to create because you are limited by the underlying structure of the surface. Because polygons and NURBS have their strengths and weaknesses, you'll find that many 3D programs offer both so that you can choose the right modelling method for any given task.

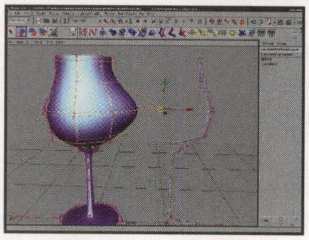
A load of metaballs

Lately, a third modelling type has emerged which merges the simplicity of polygons with the controllability and naturalness of NURBS. Subdivision surfaces provide an excellent solution

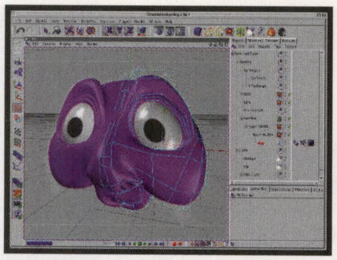
NURBS

NURBS can be edited easily by dragging the control vertices (CVs) which affect the surface beneath. CVs can also be 'weighted' which means their pull on the surface beneath can be varied to produce sharp edges or corners where needed. The problem with NURBS is that not every package has the same implementation and the features and tools vary wildly.

You may even find that a package that claims to have 'NURBS' doesn't really have NURBS at all, though it can achieve NURBS-like smooth surfaces. Usually the more expensive packages such as *Maya*, *Softimage* and so on have a complete suite of NURBS tools and features, which are unmatched in lower cost packages. *Rhino*, for example, is primarily a modeller and has excellent NURBS tools. *Pixels3D* also has a good set of NURBS tools, and version 3.6 is free on the cover CD.



The CVs form a control 'cage' around a NURBS surface. Pulling on the CVs changes the shape of the surface beneath. Note that because of the nature of NURBS, a surface or curve never actually passes through the CVs.



Subdivision surfaces are a hybrid of NURBS and Polygons in the way you use them but the technology underneath is different, relying on a series of subdivisions to achieve a smooth surface from a low-res cage.

Lights are key to getting realistic results. Falloff (or dropoff) mimics the way real light intensity decreases over distance.

for many modelling tasks, though there are few applications in the lower price bracket that can offer this type of modelling. We recommend that you seek them out if your modelling is of the organic kind. Metaballs, another method for organic modelling, though not so controllable, are like blobs of polygon goo. When you jam them together they create a bigger blob – pull them apart and they separate again. Combined with a particle system, these can be used to great effect to create gloopy fluids and other blobby liquids.

Less common are Bézier patches. These are similar to NURBS in that they are good at describing smooth surfaces with few control points.

They also have handles like a Bézier curve which can make modelling a bit more complex. Bézier patches don't support the higher level modelling options of NURBS such as curve projection, trimming, filleting and stitching.

Primitive behaviour

Another type of object worth mentioning is the parametric or analytic primitive. These are mathematically defined shapes which often have extra editable properties, such as the slice angle for a sphere, circle or torus, or the rounding of a cube. Unlike normal primitives, their parameters remain editable after creation and can sometimes even be animated which can be very handy. Once you've built your object, you can texture it. Texturing can be as simple as giving the object a colour, or it can be very complex indeed.

Entire volumes have been written about texturing which isn't surprising considering that good texturing is the key to great looking 3D images. The beauty of 3D is that you can make a

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Inspire 3D

PC Mac

Price

£299

Maker

Newtek

Contact

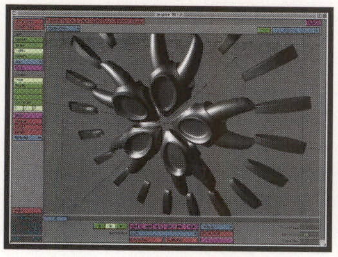
One Video

Telephone

07000 663843

Website

www.newtek.com



A cut down version of *Lightwave 3D*, *Inspire* has a great heritage and the same rendering engine as *Lightwave 5.6*. It hasn't been upgraded in a while but it still has some great features. There are two applications, Modeler and Layout. Modeler features good deformers, a rich set of polygon editing tools and excellent subdivision surfaces (MetaNURBS). Notably absent from the tool set are the knife tool and any numeric input but most *Lightwave* plug-ins (of which there are thousands) will work with *Inspire 3D* so its feature set is expandable. Animation is good, with keyframes and function curves. The renderer is capable of stunning results though the absence of an adaptive antialiasing feature means high quality images take a while. An excellent tool offering top notch rendering on a budget.

Verdict

★★★★☆

Cinema 4D SE/XL5

PC Mac

Price

SE £549 (inc VAT)
upgrade to XL5.3 £100

Maker

Maxon

Contact

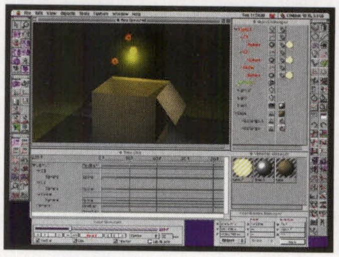
Hisoft

Telephone

01525 718181

Website

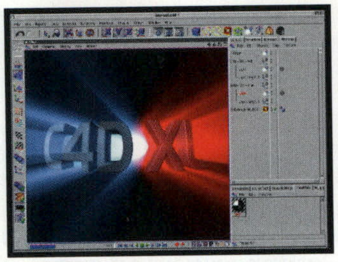
www.cinema4d.com



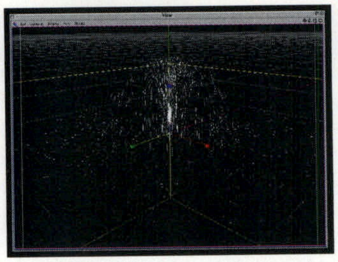
Now that Maxon has released *Cinema 4D XL 6*, if you buy *Cinema 4D SE* you can upgrade to XL v5.3 for £100. So for around £650 you get the full version of the excellent XL5.3. The package uses polygon modelling with a bit of NURBS thrown in. These aren't traditional NURBS, but you can edit the source curves and see the surfaces update interactively. If you do upgrade to XL, a sophisticated particle system features object instancing, and forces such as gravity, vortex and wind. The interface is good with drag-and-drop. Animation features keyframing, function curves and time curves which let you remap the acceleration or time using a single function curve. Decent IK, bones and goals for good character animation plus motion blur and depth of field rendering make this a powerful package and a fantastic bargain.

Verdict

★★★★★



Volumetric lights cast visible dusty cones, as if illuminating fine particles in the air. They can be used to great effect with logos and text as seen here. Proper Volumetric lights also cast shadows through the dust cones.



Particle systems help to create effects such as fountains, explosions, smoke and other flowing items.

simple object appear more detailed by using image maps to convey that detail. UV mapping is essential if you're deforming a textured object in an animation, otherwise the texture will appear to slip as the object deforms.

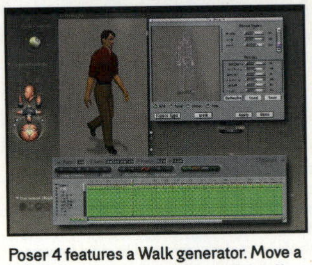
Once textured, you can light the object ready for rendering (though you could do your lighting before texturing if you wished). Any decent 3D program will have three main types of light.

These are Spot lights, Point lights (also called Omni lights because they illuminate in all directions) and Distant lights (also called Parallel lights because they mimic the effect of an infinitely distant point light source whose rays are parallel). A good 3D program may also give you further choices when it comes to light types such Area and Tube. These are special lights whose light doesn't have a single point of origin but is spread over an area in the case of an Area light, or spread out along a line in the case of Tube lights.

These two light types closely mimic the lights in the real world, for example, a Tube light would be ideal for a scene that included fluorescent strip lighting, while an Area light would be a good choice for simulating light from a window. Area lights are also useful for producing soft, natural looking illumination in situations that require realism. One type of light which we haven't mentioned is Ambient light. Programs handle this differently – sometimes there's an Ambient light source: other times it's implemented as an environment property. Occasionally, Ambient lighting can only be defined as a part of an object's material definition, which isn't so good. Ambient light has no direction or location and illuminates everything evenly. Used sparingly, Ambient light can be useful, though some 3D pros shun its use in preference to a well-designed lighting setup.

Animation tools

Traditionally animation in 3D packages has relied on keyframing. This is where the user defines key poses or positions for an object or character at different points in time and the 3D program interpolates between them to produce the in-between positions for each frame. This method is good but can be time consuming, and requires a lot of skill. Procedural systems can create animations mathematically. The user just needs to tell the system how the animation should look; for a walking character, for instance, you can specify the speed, stride length and so on, without having to manually keyframe each limb. Some systems such as *Character Studio* for *3D Studio MAX* let you animate characters by simply placing footprints on the ground for the character to follow. The main drawback is that the more work the computer does, the less artistic control you have over the nuances of movement.

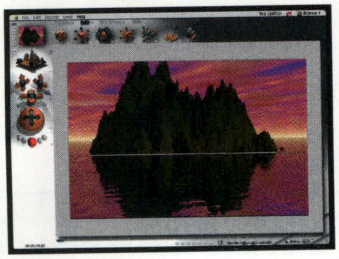


Poser 4 features a Walk generator. Move a few sliders to create a characterful walk.

Bryce 4

PC Mac

Price	$199
Maker	Corel
Contact	Corel (for list of UK resellers)
Telephone	0800 581028
Website	www3.corel.com



Designed as a landscape and terrain creation package, *Bryce* isn't what you'd call a well-rounded 3D program, but it's still very popular. Wrapped in a cheeky interface, this is a powerful package capable of fantastic imagery. The current version includes volumetric effects and also animation. *Bryce* comes with healthy raytrace rendering though its output is easily bettered by other packages. *Bryce* images tend to have that hard 3D look to them – not the best option for ultra subtle realism. Modelling is limited though you can easily import models from other programs. A large set of primitives is complemented by Boolean rendering so that you can create more complex objects. For occasional 3D use and simple modelling, *Bryce* is great and it's the obvious choice for landscapes.

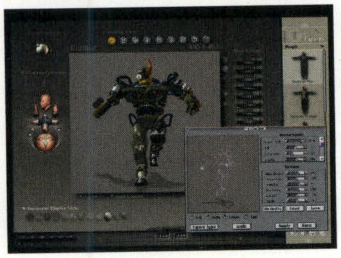
Verdict

★★★★☆

Poser 4

PC Mac

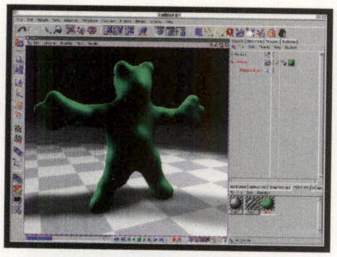
Price	$219
Maker	Curious Labs
Contact	Computers Unlimited
Telephone	0208 200 8282
Website	www.curiouslabs.com



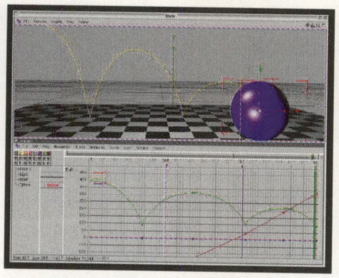
It takes a lot of skill, patience and concentration to convey human form and movement convincingly. Or you can just buy *Poser*. *Poser* is designed to make creating and animating figures simple and comes with a large selection of specially constructed models of humans, clothed and à la mode (naughty bits included) as well as a few animals and robots. You can edit the shapes and features of the figures using simple dials, and even deform them using magnets. *Poser* features a decent keyframe animation system so that you can bring figures to life. An impressive Walk generator makes short work of creating realistic gaits, though you can use IK to create your own motion by hand. Rendering is basic but figures can be exported for rendering elsewhere if necessary. Not an all rounder but very useful.

Verdict

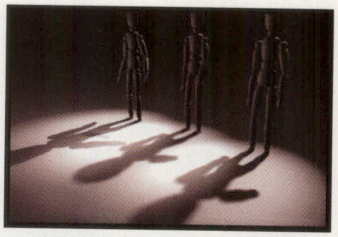
★★★★☆



Metaball modelling forms a polygon skin around points or splines or special metaball objects depending on the forces of attraction between them. It's very much like modelling with blobs of sticky goo, and is ideal for vague organic shapes.



Function curves are essential for fine-tuning animation data. They graphically represent the motion of objects – or indeed any animated parameter such as colour – so you can easily make changes.



Shadows can be raytraced or depth mapped. Raytraced shadows usually have hard edges and can look unrealistic in most situations. Depth map shadows use an image taken from the light source location and are naturally soft edged. Area shadows are raytraced but produce very realistic soft shadows.

Texturing is an art in itself. Well-textured objects can look totally realistic even though the actual shape may be quite simple. This plank is just a simple round-edged cuboid.

Just drawn that way

Animation capabilities in 3D packages range from simple camera flybys to character animation to dynamics simulations. Most rely on keyframing, where properties such as position are recorded in keyframes and smoothly interpolated to create motion. With more complex animations, you'll need to have more control over how the interpolation occurs so that you can control the timing, acceleration and smoothness of the animation.

Function curves are the best way to do this. These are graphs which visually show the keyframes times and values and also the interpolation between them; usually as a curve. Bézier handles on the keyframes enable you to edit the shape of the curve and thus the acceleration and speed of the object between keys, though not all 3D apps have this feature.

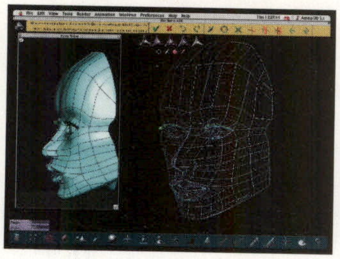
While you can keyframe all of an animation by hand, some things, like leaves blowing in the wind or a shoal of fish, are best left to the computer. Combining particle systems and dynamics simulations (the behaviour of objects according to physical laws) can create realistic swarming or flocking motions, or the semi-random motion of objects blown by the wind. The surprising thing about all this is that until fairly recently, these particle systems and dynamics were the domain of high-end packages costing thousands – now low and mid range 3D programs can lay claim to them as well. Rendering is a bit of a moot point among 3D pros because quality varies between packages. While it is difficult to say which is the best renderer, it's certainly easy to find mediocre or downright nasty rendering engines in basic 3D packages so be careful. A good renderer needs to be able to handle extreme subtleties in shading and colour otherwise you are seriously limiting your palette. Rendering features and effects are another thing to look out for, though they often bear little relation to image quality.

Raytracing is the most common rendering technique, though if badly designed it can be slow and ugly. Many systems employ a hybrid system, mixing scanline rendering, which literally shades objects a line of pixels at a time and raytracing which comes in handy only for reflective or refractive objects.

Antialiasing is used to reduce 'jaggies' at object edges and is one of the prime factors in determining image quality. A well-designed 3D renderer will give you good control over antialiasing, and you'll also be able to achieve artifactless images and smooth animations that don't shimmer and fizz.

Amapi 5 PC Mac

Price	£299
Maker	TGS
Contact	Computers Unlimited
Telephone	0208 200 8282
Website	www.tgs.com



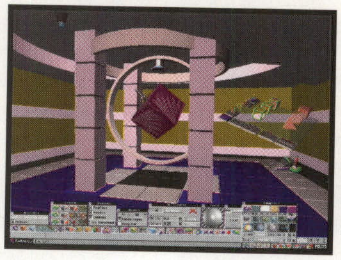
Originally from French developers Yonowat (now TGS), *Amapi* is a full 3D modelling, rendering system with basic animation tacked on. A disappearing toolbar is one feature of the unusual interface. Modelling is a strong point. NURBS, polygons and subdivision surfaces are mixed to good effect. There is a decent editing toolset and modelling feels quite intuitive once you get used to it. Some neat features include an Interactive Rounding and Filleting tool, five types of smoothing algorithm and interactive deformers such as Twist, Taper and Bend. The raytrace rendering is good, but not exceptional but the material and texturing system can be difficult to use. Import and export are good and their ZAP format is useful for delivering online 3D content. An intuitive system capable of sophisticated results.

Verdict

★★★★☆

trueSpace 4.3 PC

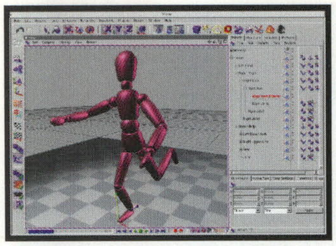
Price	$399
Maker	Caligari
Contact	Caligari
Telephone	001 650 390 9600
Website	www.caligari.com



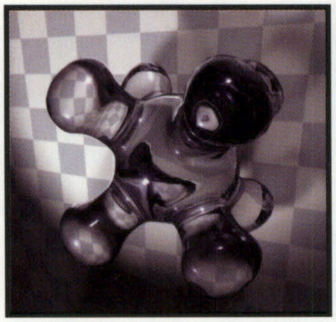
At version 4.3, *trueSpace* sports a large set of features that includes IK, bones, hybrid radiosity, dynamics with collision detection, scripting, subdivision surfaces and metaballs. The interface (unusual in that it cannot be divided into planes), can run in fully shaded DirectX or OpenGL, and features 3D tools and widgets that help with moving and sculpting objects. There are some nice features such as contextual geometry component selection, and subdivision surfaces modelling, and most of the polygon tools work on subdivision surface objects. The integrity of some surfaces is suspect at times though. Its keyframe animation includes a decent timeline and character animation is possible through the bones and IK. Value for money, provided you can get on with its interface and conventions.

Verdict

★★★★½



Inverse Kinematics (or IK) is a special animation aid which lets you animate the legs, say, or a character just by moving the feet. If you drag a foot with IK, the knee and hip will bend to keep the limbs attached.



Raytracing is a rendering method which accurately calculates the path of imaginary light rays through a scene. Raytracing can account for physical phenomena such as reflection and refraction (where light is bent by transparent objects of varying density).

Beyond raytracing there's radiosity, which can produce very realistic and natural images by calculating how light is reflected and absorbed by the objects in the scene. The downside to radiosity is that it's time consuming. The calculation is not dependent on image resolution, however, making it ideal for high quality, high-res stills.

Another thing to look out for is an upgrade path. Some manufacturers offer good deals for upgrades to their more advanced packages, which makes upgrading easy if you outgrow your current package. The other thing is that you won't have to relearn another package, and your hard-won skills will be immediately transferable.

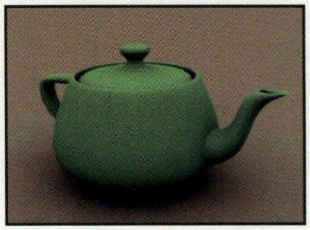
Some programs are extensible and can have their features or functionality improved via plug-ins. This is always an advantage since you can often download free or shareware plug-ins from the Internet that improve the base package. A typical example is *Lightwave 3D* which has innumerable plug-ins, many of which are free.

The bottom line is that there are lots of options in 3D and each 3D package approaches things in a different way. We've reviewed eight market leaders here to help you decide which one's for you. If all you need are a few simple Web graphics or flying logos, then almost all 3D packages will be able to do that, but if you crave photorealism or character animation then the choices are narrower. **ca>s**

Radiosity & global illumination

The search for better and better rendering systems is never-ending in 3D. Lately there seems to be much more interest in radiosity and global illumination techniques to achieve greater realism and better looking output. This has probably come about because the increase in the average Mac or PC's computing power has brought the rendering times for these complex procedures within reasonable tolerance levels.

In a real room with a single bright light source (such as a window) every corner receives some degree of light because the light energy is bounced around and reflected by the objects in the room, as well as off the walls, ceiling and floor. With traditional rendering techniques these secondary and tertiary bounces aren't taken into account, so complex lighting setups have to be devised to manually recreate the effect. Although radiosity is time-consuming, accurate lighting is calculated automatically.



Radiosity can calculate inter-object illumination and Ambient lighting accurately. In this render, the only light source is a luminous hemisphere simulating the sky.

For info and images on radiosity and global illumination check these sites:
www.lightscape.com
www.lightwork.co.uk
www.3dluvr.com/pepeland
http://radsite.lbl.gov/radiance
www.accurender.com/gallery
www.graphics.cornell.edu/online/research/
www.umlaut.fr/xsi/FinalGathering.html

Hash Animation Master 2000

PC Mac

Price

$299

Maker

Hash Inc

Contact

Hash (buy online)

Telephone

001 360 750 0042

Website

www.hash.com

Occasionally you find a program that does something exceptionally well and costs very little. *Animation Master* is one of these gems. Its main goal is character animation and it has a powerful animation system that rivals more expensive packages. Instead of using polygons or NURBS for models, the program employs Hash Patches. These are Bézier-like surfaces that can withstand the rigours of deformation during animations without fraying at the seams. Modelling, skeleton set up and animation are handled separately so that animation can begin before a model is completed. The bones and IK system is sublime and one of the best we've used. It's not a well-balanced package though capable of producing flying logos or landscapes, but if you're after character animation on a tight budget, there's no competition.

Verdict

★★★★½

Strata 3D Pro

PC Mac

Price

£517

Maker

Strata

Contact

Gomark

Telephone

020 7731 7930

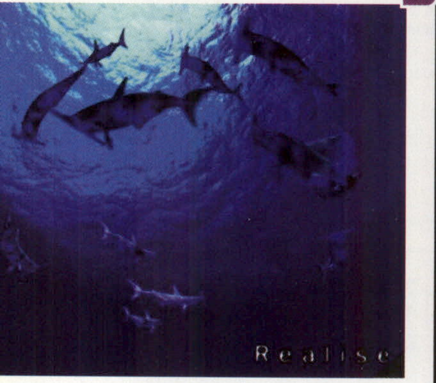
Website

www.gomark.com
www.strata.com

A good all-round 3D package that features polygon and Bézier patch modelling, excellent raytrace rendering with radiosity, and a decent animation system. It's actually the 'pro' version of *Strata 3D* and available for free (or a minimal fee for a boxed version with manuals). The two packages are identical except that the pro version has a selection of plug-ins. The interface is a traditional collection of windows and floating palettes which never seem to fit together efficiently. *Strata 3D Pro* has some nice 3D text tools, with interactive control over the shape of bevels, depth and kerning. The bevel can be shaped using a Bézier profile from the Object Properties panel. Rendering quality is high, and *Strata* also features help with scene lighting, good antialiasing controls and radiosity for the ultimate in realism.

Verdict

★★★★½



1. According to Paul Simpson, "This was our first good-looking work". Although not widely seen, the video for drum n' bass artist Photek's *Modus Operandi* defined Realise's photo-realistic reputation.

Realise Studio

It's crafted photo-realistic beetles, helped Shirley Manson shoot down the rest of Garbage and now Realise is riding high with First Direct. *"It's great," says director Paul Simpson. "There's just this little guy. It renders so fast."*

Like its most famous creation, the Little Fella, currently starring in the First Direct adverts, Realise Studio doesn't have a problem telling its clients, 'No'. But in contrast to the Harry Hill-voiced character, who finally decides to 'Meet you halfway', compromise is not a word in its vocabulary.

"There is a huge mistrust outside the industry that 3D can look good and realistic because most companies are enthusiastic and say 'Yes, Yes, Yes'," explains director Paul Simpson. "One of the things we say to people is 'No, we can't do that' or, 'That is going to take ages', because blind enthusiasm is very damaging. We've been in the business long enough to know that what we do is really, really hard."

Four years after founding the 3D animation studio with co-director Stuart Gordon, the long hours and the attention to detail are starting to pay off. Realise has built on its early expertise as a specialist in photo-realistic effects to gain an all-round reputation for technical excellence.

"It takes a long time to get a good name for yourself," Simpson says. "There are a lot of people who do one good job but that may burn them out. We've been lucky that we have been able to do time-consuming jobs and still remain friends."

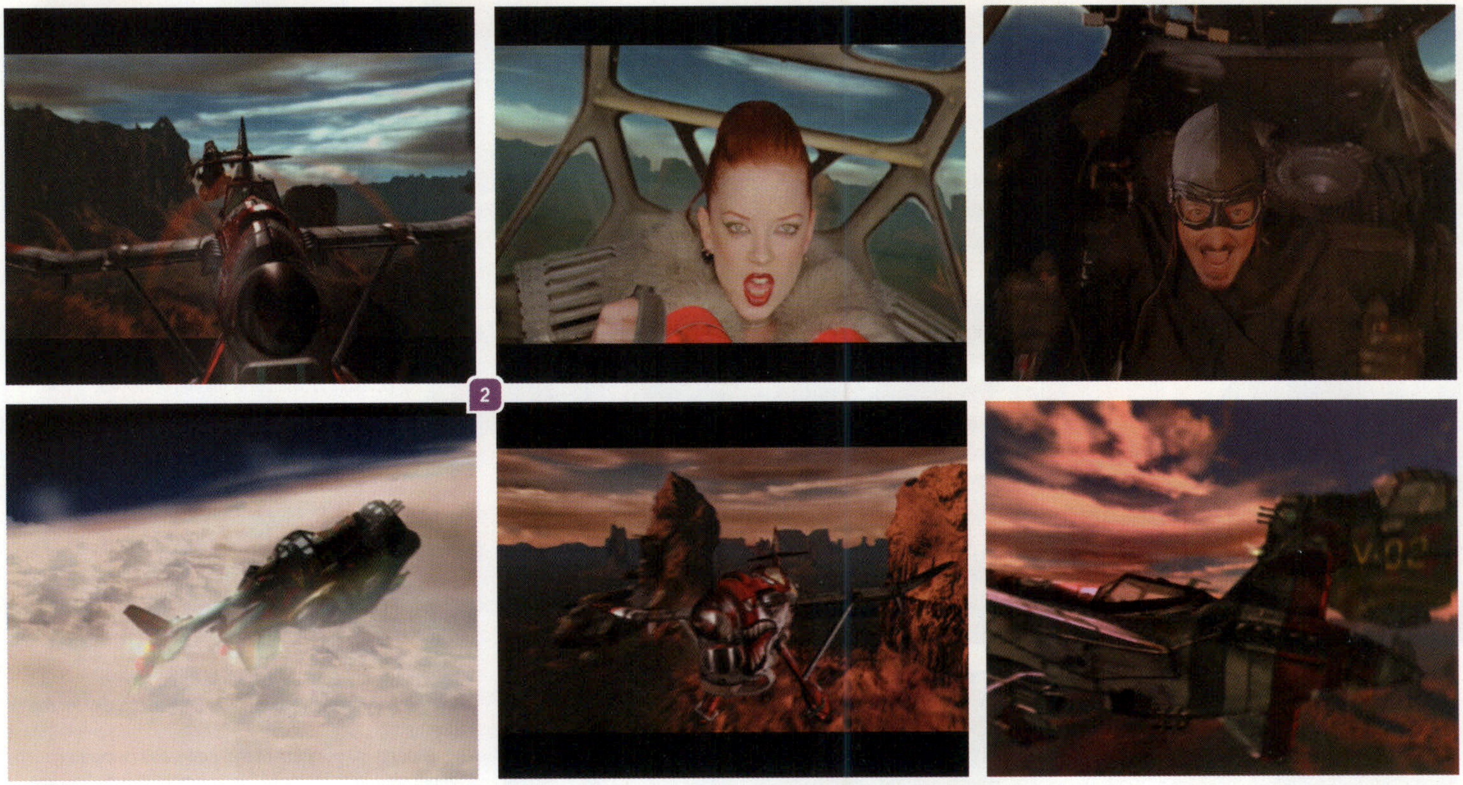
Their partnership has other strengths as well. Simpson's background in programming and 3D graphics complements Gordon's illustration and animation experience. They first met working on a

Getting into the business

"It's easy to get a job in the 3D industry," reckons Paul Simpson. "All you do is create 10 or 20 seconds of really amazing animation – no more than that. We get sent these long showreels of standard work and you don't want to show anything other than good work. Spend three weeks on ten seconds. Keep it short. Keep your CV down to one page and think about what you are writing."

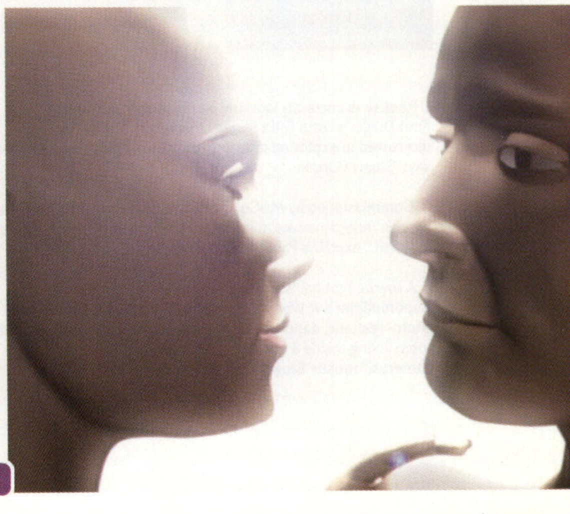
Another point worth emphasising is that at the entry level you should know one area well, rather than being average in several areas. So if you want to be an animator, concentrate on animation. "You could be animating boxes, even wire frame boxes," Simpson says. "If your animation is good enough, you'll get a job tomorrow."

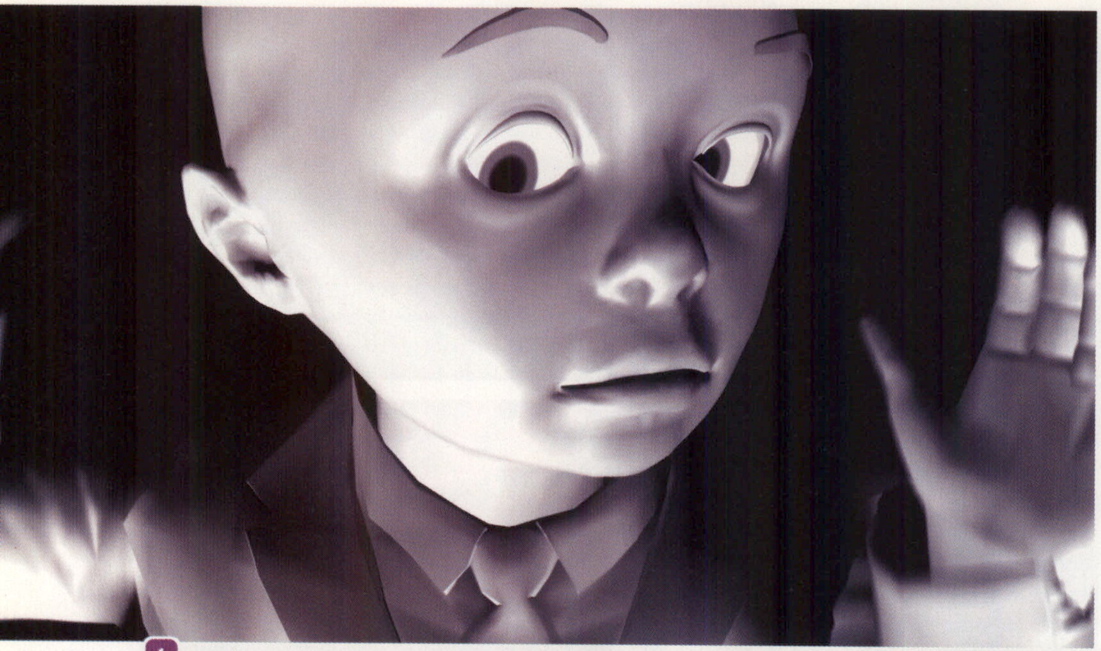
As for that old chestnut of which is the best entry-level 3D package, it doesn't matter. "Whatever what you can get your hands on," is Simpson's advice.



2. Commissioned by Dawn Shadforth, the video for *Special* underlined the quality of Realise's work, while almost destroying the team in the process. It won an MTV award for special effects. "It was terrifically tough. We did a ridiculous amount of work," says Simpson. "We did 73 shots, each shot having three or sometimes four layers." Gordon recalls having to leave the office to be physically sick at 3am, only to come back to continue working.

3. The four week, 100 per cent CGI video for Yazoo's *Only You* was the first 24/7 project that Realise undertook. Interestingly, the director was Mark Nunneley, who also directs the First Direct adverts. The main program used for animation and modelling is Side Effect's *Houdini*. For writing shaders, Realise uses Cinema's *ShadeTree* with a bit of hand coding thrown in.





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Defining the future

One of the projects Paul Simpson is working on is an application for Sony's new parallel GSCube workstation, or visual synthesiser as Sony prefers to call it. Consisting of 16 PlayStation2 CPUs and 16 enhanced graphics chips, the GSCube is designed to support real-time rendering of even high resolution content such as CGI movies. Currently it's still in the prototype stage, although Sony is expected to release a professional box, which may boast up to 64 processors in parallel, by the end of the year.

"We're creating an interactive demonstration which will show what the future of entertainment is going to look like," says Simpson. "What we're doing something quite different. It's not a game – it's more of a performance." As for the power of the GSCube: "It's going to be amazing," he says.

1. Realise is currently working on the fourth instalment of First Direct's Little Fella series of adverts. "I think they are interested in exploring it further and getting more outrageous," says Stuart Gordon.

2. Commissioned by MeCo, the company famous for designing Bjork's record sleeves, this was a small ident for MTV. "It's just a jellyfish," explains Paul Simpson helpfully.

3. A low budget collaborative project, the video for Supercollider's *It Won't Be Long* mixes dark humour with a photo-realistic, dancing fly. "We actually had captive flies in the room, living inside a glass bowl and we filmed them with little cameras," recalls Stuart Gordon.

short film for electro-experimentalists Future Sound of London and when their paths crossed again a few years later, a combination of their talents seemed the natural course of action. "To make your mark in Soho, you have to produce good-quality work," Stuart Gordon adds. "Then people will come to you with big projects if they trust you in terms of delivery. We will deliver on a deadline, and that's the bottomline."

Working for Garbage

The first big test for the pair came in 1998 when Black Dog's Dawn Shadforth commissioned them to do a video for techno-rockers Garbage. "Everyone said we were mad to take it on and we would fail and be sued," Simpson recalls, with a grin. Gordon continues, "Normally it would have been a three month job but we did it in seven weeks. It was 24 hours a day for the last half."

Around 80 per cent of the video was computer generated, with the only live action being the footage of the band in the cockpits of their steampunk aircraft. Realise also decided to make things harder by additionally offering to generate all the backgrounds. "We spent a day or so doing a little test, and we made this rocky landscape terrain, so it was like, 'OK, cancel the helicopter, don't go to America to film,'" says Gordon.

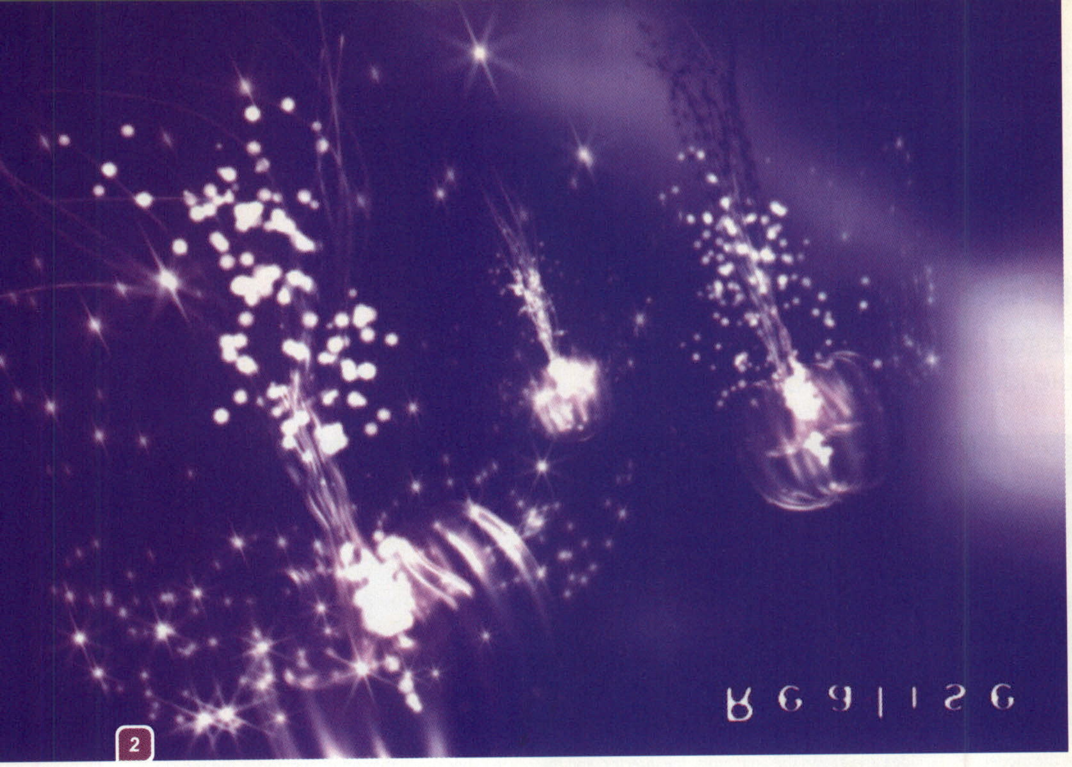
But the results were well worth the extra work. *Special*, with its computergame-inspired sequences of strange craft dogfighting through a Grand Canyon environment, won an MTV Music Video Award for the best SFX, and the video still receives airplay. "It was terrifically tough. We did a ridiculous amount of work," says Simpson. "We did 73 shots, each shot having three or sometimes four layers." Gordon recalls having to leave the office to be physically sick at 3am, only to come back to continue working.

In comparison, the First Direct campaign is a walk in the park. "It's great," says Simpson. "There's just this little guy and everything else on the screen is black. It renders so fast. With Garbage it was much more difficult because every pixel was 3D."

The awards keep coming too. Little Fella recently won gold and silver British TV Advertising awards. Realise is starting to build up quite a collection on its office wall.

The campaign has been good for Realise in another ways as well. "We're always looking to do something different," Gordon says. "The next stage is to do something even more cartoon-y, so we're looking at ideas for that now. We're playing with different looks, trying to get away from the *Toy Story* thing. We know we can do that. We use the same software as Pixar."

This is one of the great strength of Realise: something Paul Simpson calls its 'secret weapon'. Realise's software choice isn't driven by the industry standards of nearby Soho, but that of Hollywood.



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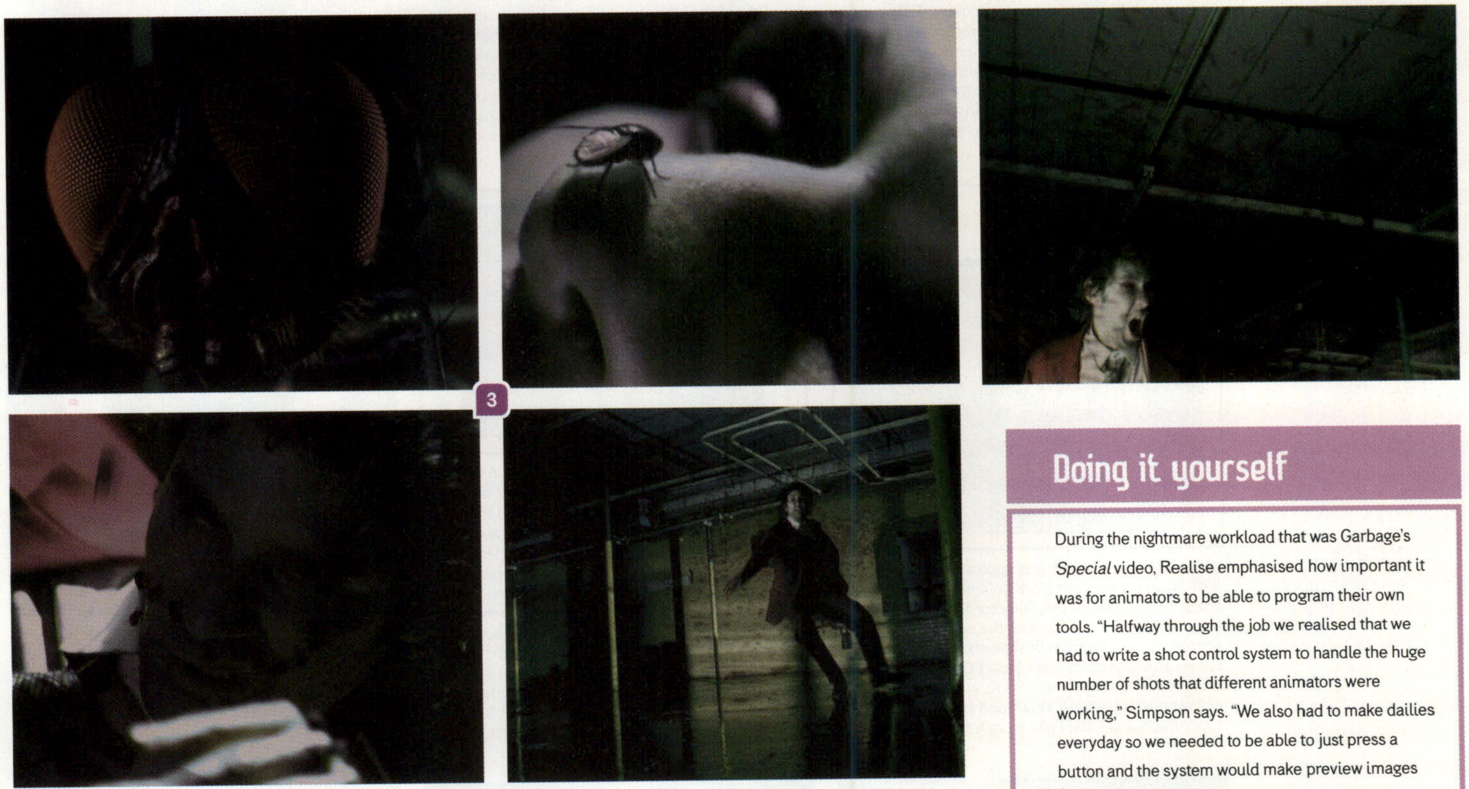


3

This is hardcore

“The main program we use is Side Effect’s *Houdini*,” explains Simpson. “It’s a high-end 3D animation system that we use for doing all our animation and the modelling.” For writing shaders, Realise uses Cinema’s *ShadeTree*, although also undertaking some hand-coding as well.

“If you want to do something a little bit different you need to be able to roll your sleeves up and get behind the scenes,” notes Gordon. And of course, for rendering, nothing beats Pixar’s *RenderMan*.

Realise underlines its technical ability on the hardware side, running most of its rendering in-house on six 800MHz Linux-based PCs. A proprietary tool called *Tyranny* makes sure that the machines are always as busy as possible. “When you think about the number of hours in a day – if you are careful about how you feed stuff into the system, you can get a lot of rendering done,” Simpson explains. “The big thing about rendering is that it doesn’t matter how many machines you have, what counts is how you optimise your renders.”

However, Simpson is keen to stress that tools are not as important as some in the industry would have you believe. “People should completely forget about which programs offer the most features. It’s all about what you can get out of a package,” he says. “When I first started out, I was using *3D Studio MAX* and I remember thinking that we could do better stuff with it than a lot of people in Soho could do with Silicon Graphics machines. Now you see people coming out of their bedrooms doing great things because they are using their tools well.” ca>s

Doing it yourself

During the nightmare workload that was Garbage’s *Special* video, Realise emphasised how important it was for animators to be able to program their own tools. “Halfway through the job we realised that we had to write a shot control system to handle the huge number of shots that different animators were working,” Simpson says. “We also had to make dailies everyday so we needed to be able to just press a button and the system would make preview images and dump them down to VHS automatically.”

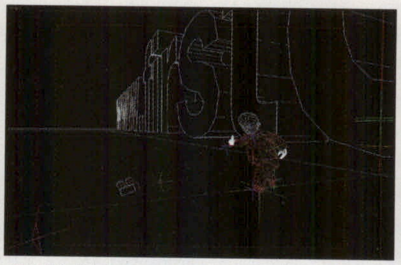
At the time, there was a guy from Industrial Light and Magic in the office. “He said it would take two weeks to do,” recalls Stuart Gordon. “We only had three days but we did it. If we hadn’t have had that experience, we would have been sunk overnight.”

You can contact Realise Studios on [t] 020 7434 0770, [f] 020 7434 1386, [w] www.realise.demon.co.uk

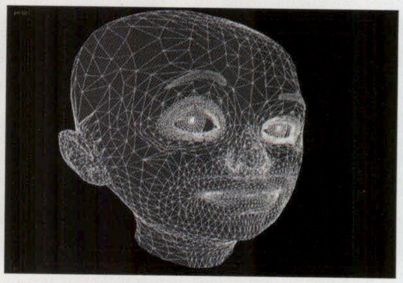
"Oh alright then, I'll meet you halfway"

Realise's award-winning Little Fella ad for First Direct combined an absence of colour in the 3D space with a simple idea, to create a dramatic piece

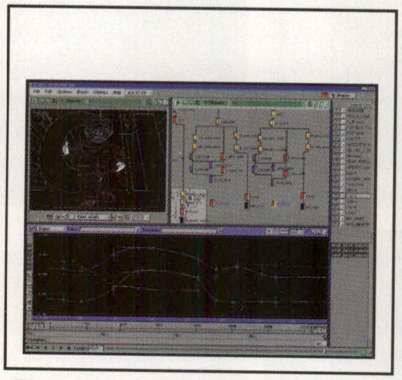
1 From the outset, great attention was paid to creating fine detail so that the model could withstand close scrutiny. Tear ducts, for example, were built in the eyes. The design of the model enabled Realise Studio to render Little Fella using smooth subdivision surface technology. Following the approval of a script, a sound recording was made of the comedian Harry Hill performing to the script which was delivered to Realise Studio. The Audio track became the guide to the character animation, timing, and lip-synching within each shot. Sound effects and music were also added.



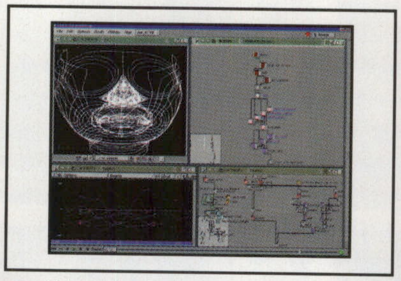
2 Work began on creating a line test after the approved voice-over was received. The line test is basically a 3D animated storyboard of the idea and allows the animators, the director, and the client to get a feel for the timing of the commercial in a visual form. Simple wire frame figures and props filled in for Little Fella and the logos. An animator sits down for a week with the director and sketches out the action and composition of each shot using the 3D software. Included in the line test is the placement of the camera and simple camera/prop and actor movements that match the voice-over.



3 A sculpture was created as a template for the character's head. This was laser-scanned using a cyber-site high resolution scanner and the resulting 3D computer model was loaded into the studio's 3D software. The head was re-built and modified using *Houdini*, together with Realise Studio proprietary techniques, resulting in a totally procedural and fully animatable head. Little Fella could convey a full range of expressions with over 50 virtual facial muscles, as well as over a dozen phoneme mouth-shapes for lip-synching.

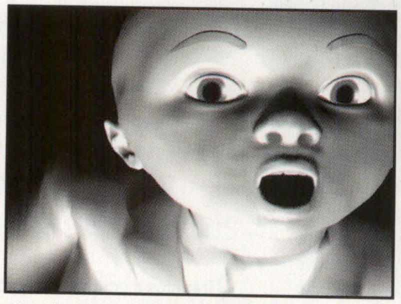


4 Once the line test was approved, the animators began work on animating the character in all the shots. Director Mark Nunneley, observed and interacted with the keyframe animators to deliver the best performance for each scene. The animators were Stuart Gordon, Steve Brown and Vanessa Arsen. Shots were divided between all three with Stuart also providing supervision and Little Fella technical assistance.



5 This complex system was 'wired up' in such a way so that only higher level controls were needed for animation. This design allowed the animators to free themselves from technical details and to concentrate on making Little Fella perform as any actor would. The head of the model was created using a two layer system that linked the facial muscles to the mouth so that lip-synching triggered the relevant facial muscles. This optimized the animation control use and allowed real-time playback. The rendered head underwent a process which joined separate head-parts (not needed for the lip-synching but necessary for all other facial expression) into one smooth-skinned object.

6 The shots were worked on simultaneously which meant that each day the director could see the work of each animator and give feedback. Extra shots were prepared to cover the possibility of interest rates changing in the few days before the commercial aired.



7 The lighting rig from the earlier spots was adapted to fit this one. Primarily, Little Fella was underlit with up to 16 lights in any given shot. Individual lights were assigned for eyes, and other parts of the body, with shadow-casting from some, and others acting as Fill and Area lights.

8 Over the course of the three commercials, Little Fella has become more than just the sum of his constituent parts. "Little Fella's long list of wonderful expressions and gestures meant there was much discussion when deciding how a shot should be animated," remarked Paul Simpson. "We needed to make Little Fella work hard to deliver a convincing performance and so we had to have all the performance capabilities and the emotional range of any actor at our fingertips."

9 For the final render, *Renderman*, from PIXAR, was used. This is Realise Studio's renderer of choice as it is capable of producing any 'look' desired, as well as being customisable to suit any creative need. *Renderman* has the added advantages of being fast, even with motion blur renders, which is a bonus when creating cinema resolution animation.

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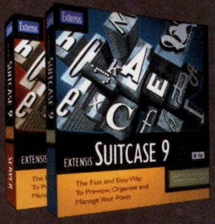
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Illustration: Simon Danaher [e] simond@naher.demon.uk [t] 01633 250828

Cinema 4D XL 6.1

Combine the animation capabilities of this user-friendly package and bhodiNUT's new shaders with this multi-eyed alien…

Creating animated characters is a tricky business but thanks to today's 3D programs, even a complete novice can create and animate a character. In this tutorial we show you how easy it is to create a very simple eye that can be animated with the minimum of fuss using *Cinema 4D XL 6.1*.

XL encompasses modelling, animation, lighting, texturing and rendering all in a single neat package. It has a very friendly interface that can be customised to suit your needs, though the default set-up will be fine for this tutorial.

Once the eye is set up we can texture it using the new Smells Like Almonds shaders from bhodiNUT. These can be used instead of image maps directly from within *XL* so that you won't have to rely on painting skills or a 2D image editing application to create the textures.

All the support files are on the CD along with the demo versions of *XL 6.1* and *Smells Like Almonds 2*. Once installed (simply drag the bhodiNUT folder into *XL*'s Plugins folder on your hard drive) all the features of the shaders will be accessible, but when you render, a grid will be superimposed on the image.

Files on disc

Expertise provided by Simon Danaher [e] simond@naher.demon.co.uk. Tutorial files, and demo versions of *Cinema 4D XL* (for Mac/PC) and *SLA 2* are on the cd. *Cinema 4D* is priced at £1,395 and *SLA 2* costs £1,119.95. For more info, contact Hisoft on 01525 718181.

Part 1: Making an eye

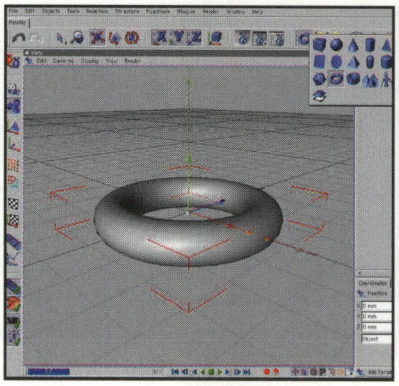
XL6's modelling system is based on hierarchies, enabling you to achieve great flexibility and control when modelling

Hierarchies

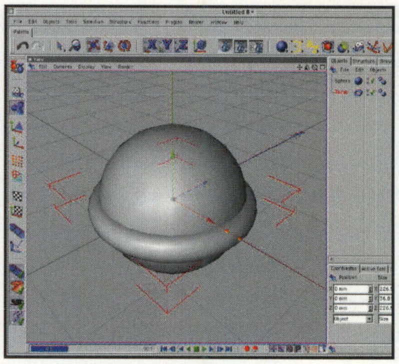
You can edit the objects in the hierarchy to affect the outcome of the function at any time. A hierarchy is created when one object is grouped within another. They don't have to physically overlap in the 3D view, it's just a way of creating more complex relationships between objects.

Extrude NURBS

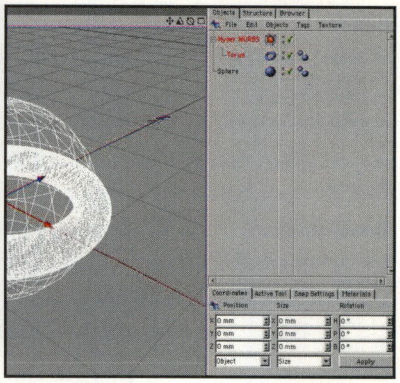
XL takes the notion of hierarchies further by making some modelling functions execute only when a hierarchy is created in the Object Manager. Drag a Spline curve into an Extrude NURBS object and it will be extruded.



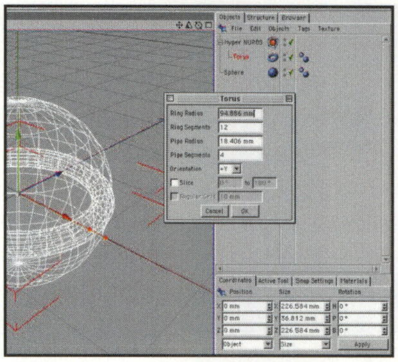
1 *XL6* has an extremely powerful modelling system based on hierarchies. You can make use of this when building models to achieve incredible flexibility and control. You'll also have the animation control you need without jumping through hoops. To create an eye rig, begin by adding a torus.



2 Now add a sphere. *XL*'s analytic primitives are very useful because many have on-screen handles that can be used to vary their properties. Select the torus and drag the orange handles to scale it to fit the perimeter of the sphere. Note than one handle scales the radius, the other the thickness of the pipe.



3 The real beauty of *XL*'s primitives is that you don't need to convert them into polygons to use them with deformers. They are in fact continually converted to polygons, and that's what you see on screen. Next add a HyperNURBS object and drag the torus into it in the Object Manager.



Torus

Ring Radius 94.886 mm

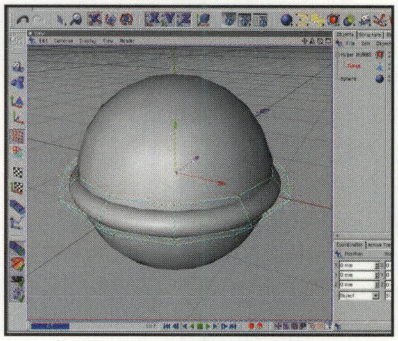
Ring Segments 12

Pipe Radius 18.406 mm

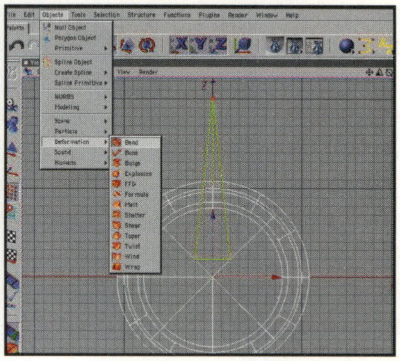
Pipe Segments 4

Orientation +Y

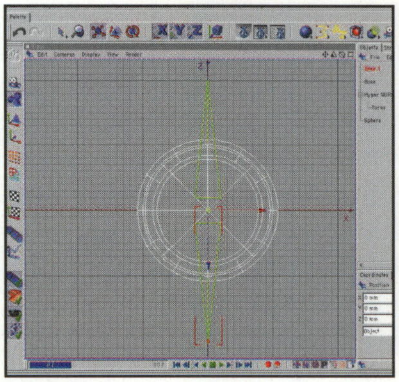
4 You won't see anything happen at first, but the polygon version of the primitive torus is now being used as the control cage for the HyperNURBS surface. The cage resolution is too high, so open the Torus options by double-clicking the Torus icon in the Object Manager. Change the Ring Segments to 12 and the Pipe Segments to 4 and click OK.



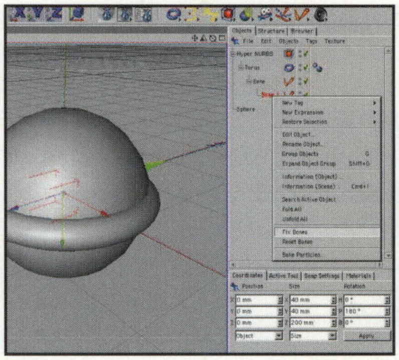
5 If you switch to Wireframe view (Display menu) during the last two steps you'll see the HyperNURBS surface resolution change as you decrease the cage resolution. If you want to see the polygons, you can quickly convert the primitive to an editable object by hitting the 'c' key, then the Return key to enter Point mode. Undo to return the torus to its analytic state.



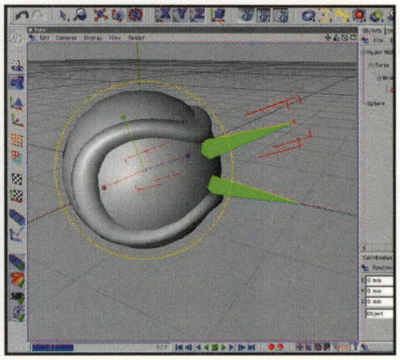
6 Why bother with the HyperNURBS though if you can adjust the torus' resolution yourself? Well, it becomes clear when we add the bones. Go to a Top view and switch to Isoparm display. Now add a Bone from the Deformers button on the toolbar (or from the Objects>Deformation main menu).



7 Add another bone and set its Pitch to 180 degrees. You can enter Position, Rotation and Scale values for any item in XL using the Co-ordinates Manager located in a Tab at the bottom right of the interface. The two bones should now be back to back.



8 Switch back to Perspective view. In the Object Manager drag the second bone you created (Bone.1) into the first bone to make it a child of that bone. Then drag the whole lot into the Torus object. To make the bones deform the torus they must be 'fixed'. Select the Bone hierarchy and choose Objects.Fix Bones from the Objects Manager.



9 Now select the child bone (Bone.1), select the Rotation tool from the toolbar (or use the 'r' hot key) and drag the red x-axis handle on screen to rotate the bone and deform the torus. This is the basic set-up for our eye and by animating the bone rotation we can make it blink. But it's not quite right at the moment. This is EyeStep1.cd4*** on the CD.

Part 2: Fine-tuning the eyelids

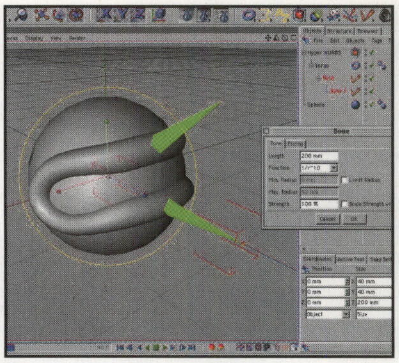
Now to improve the deformation and get the bones working properly using the Expressions editor and some strong COFFEE....

COFFEE

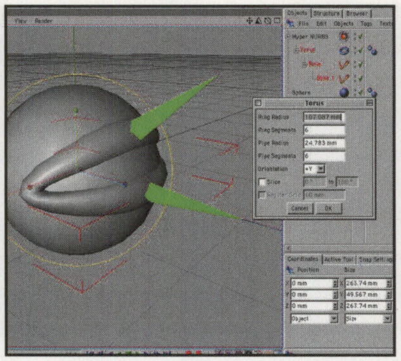
In *Cinema 4D XL* expressions are written in COFFEE, which is a scripting language. If you look at the supplied expression it's really quite simple, and there aren't any complicated equations to figure out.

Tessellation

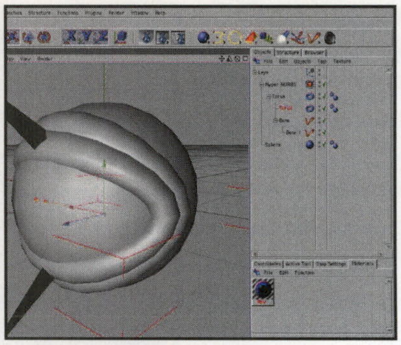
To speed the display you can use the Display>Level Of Detail submenu in the View title bars to reduce the on-screen tessellation of analytic objects and NURBS.



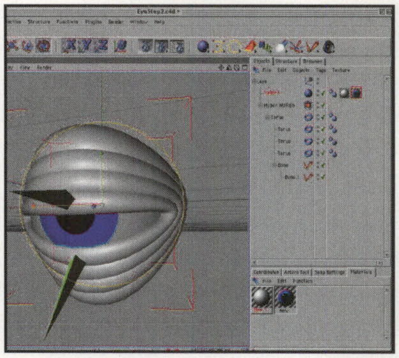
1 There are a few problems with the deformation of the eye lid, the worst being that the Falloff of the deformation is too quick. We want the torus to only bend right at the corners along the x-axis. We can achieve this by changing the Bone function. Open the Bone options for the parent bone and set the Function to 1/r^10.



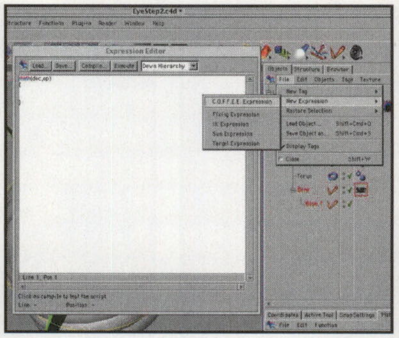
2 That has improved things but it's not ideal, but this is why we have a HyperNURBS set up. If you now open the Torus options again and change the Ring and Pipe Segments settings to 6 you'll get a much better deformation. That's because the bones are not deforming the smooth HyperNURBS surface but the coarse control cage of the torus.



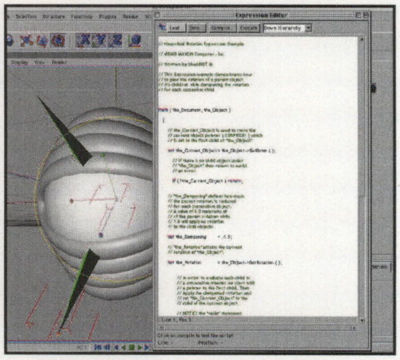
3 We can 'fill in' the area behind the eye opening with copies of the torus. Copy/Paste the Torus object (not the HyperNURBS) and delete its bones. Then drag the copy on to the original torus to make it a child. You'll notice that it still gets subdivided by the HyperNURBS and is also deformed by the bones. Now drag its green y-axis handle using the Move tool to place it behind the first torus.



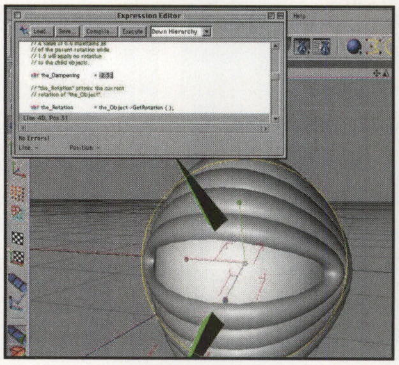
4 Remember you are moving the torus before it is deformed which is why you use the y and not the z-axis handle. Control-drag the new torus in the Object Manager to make another copy and drag it further back. Repeat until most of the eye is covered. When you rotate the lid bone, all of the tori will be deformed as one. Neat eh?



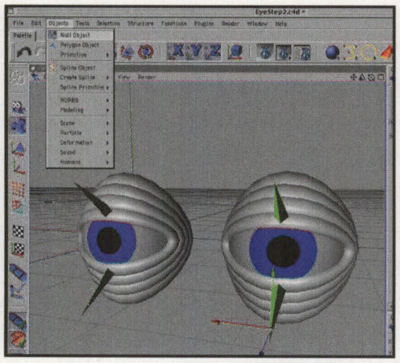
5 Now the bones are working, but it would be nice if the lower lid moved up as the upper lid moved down. You can see that animating this by hand would be a huge pain. However, we can use Expressions to create this automatically. Select the parent bone of the torus and choose File>New Expression>COFFEE Expression from the Object Manager menu.



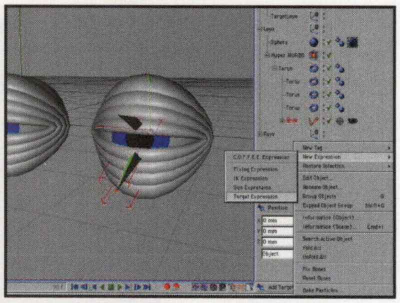
6 The Expression editor will open and a COFFEE icon will be added next to the bone in the Objects Manager. Don't worry, you won't have to write the expression yourself, just click the Load button and navigate to the file BoneRotXps.txt from the CD. This is a modified version of an expression example that comes with *XL6*.



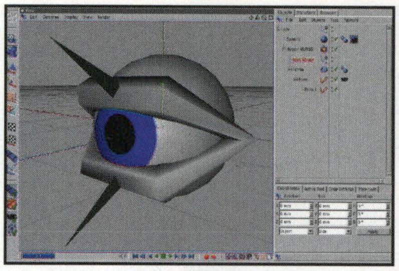
7 Now this time when you rotate the parent bone, both bones rotate together. You'll now only have to keyframe half as many items to get the blink. To vary the effect, find the line in the expression that starts 'var the_Damping = -1.5' and change this value to -2, or -0.5. Don't forget to click the Execute button after a change to the Expression.



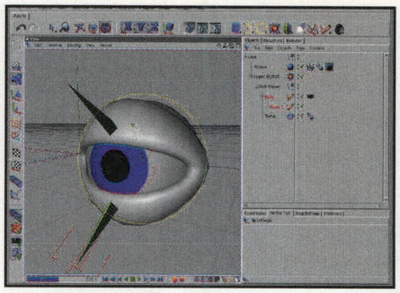
8 When there are two eyes, it is again a chore to animate the eye separately. We can add targets to link them together though. Duplicate the eye and move it -290 units to in x, rename it Leye. Now add a Null object (Objects>Null object) and name it TargetLeye. Duplicate it and rename the Null TargetReye. Move the TargetLeye -290 units in x.



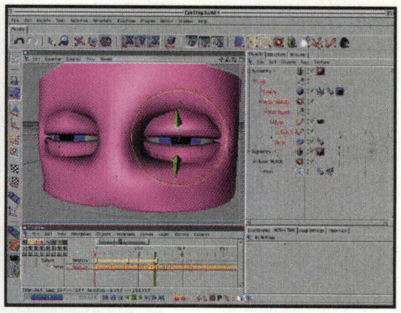
9 Add another Null, name it Blinker and place it between the eyes. Then drag the two target nulls into it in the Object Manager. Select the parent bone in the Leye and choose File>New Expression>Target Expression to add this tag to the bone. Open it and type TargetLeye in the text field. Repeat for the right eye bone (except type TargetReye for the Target tag). Now all you need to do is move the Blinker object to blink both eyes. See the file EyeStep2.c4d***.



10 Open the file EyeStep3.c4d***. There's another way to arrange the objects and bones in the hierarchy. With the set-up we had the torus and bones we linked together in the hierarchy, so scaling the torus in y for example also scales the bones. We can disassociate the bones from the torus using a Null as a kind of washer. Add a Null and drag it into the HyperNURBS object.



11 Notice that the torus is no longer affected by the HyperNURBS. Now drag the Torus hierarchy into the Null and it's subdivided again. Finally drag the bones out from the torus and into the Null so that the torus and bones are both on the same level of the hierarchy. Rotate the parent bone and see what happens.



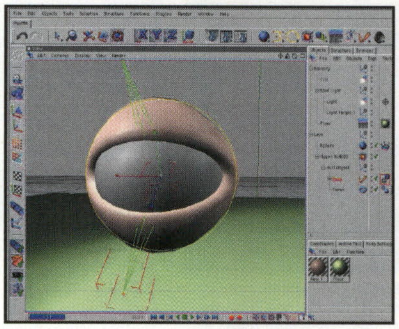
12 Now scale the torus in y. Notice that it no longer affects the bones, yet it is still affected by the bones. Now that's cool. Now move the torus in y. We have a lid that both covers the eyeball and opens and closes with a nice sweeping, bulging motion. See the file EyesFin.c4d***.

Part 3: Creating textures using Smells like Almonds shaders

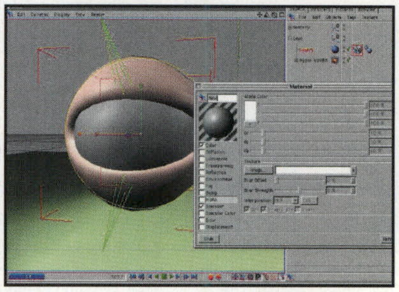
You'll need to install the demo version of shaders first, which can be found on the CD. Simply decompress and copy the folder to the *XL6* Plugins folder

Analytic primitives

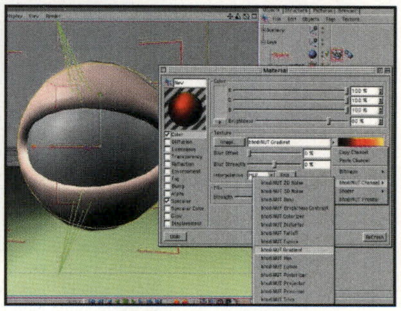
Analytic primitives are 2D and 3D shapes that are generated by a mathematical formula. The polygon representation of a 3D shape you see on screen is just that, a representation. The accuracy of the representation can be improved by increasing the polygon resolution.



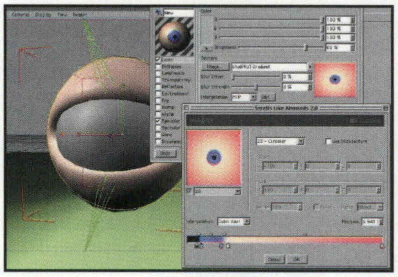
1 Open the file EyeUnTex.c4d***. This is the same Eye file from the last step, but without any textures. We'll use the superb Smells Like Almonds shaders to texture this object, without leaving *XL* or using any bitmaps.



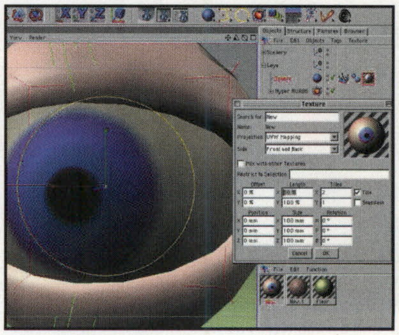
2 From the Materials Manager (Window> Materials Manager) choose File>New Material. A new grey default material is added to the list. Edit this material by double-clicking it, whereby the Material editor will open. This is a non modal dialog box so you can use the rest of *XL* without having to close it.



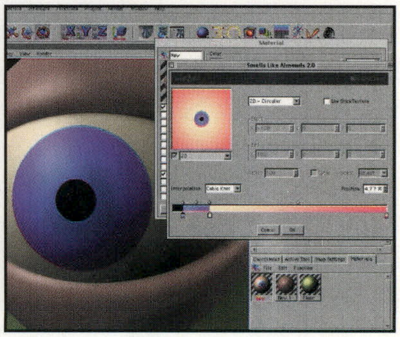
3 In the Colour channel click the sideways triangle next to the texture path field and select bhodiNUT channel>bhodiNUT gradient. So long as you've installed the bhodiNUT shaders properly (ie, put them in *XL*'s Plugins folder) you should see the bhodiNUT Channel shaders.



4 Click the Edit button to access the shader's controls. In the Gradient panel change the gradient type to 2D–Circular from the dropdown menu. We'll be making the sclera, iris and pupil colours here. Using the gradient strip at the bottom, add the colours to make the eye parts: pink, off-white, purple, blue and finally black. The strip works just like *Photoshop*'s so it's easy to figure out.



5 Click OK and then drag the material from the Material Manager to the eyeball sphere in the Object Manager. In the Texture dialog that appears, set the x Length setting to 50 per cent and hit Return. Do a test render (Render>Render View).



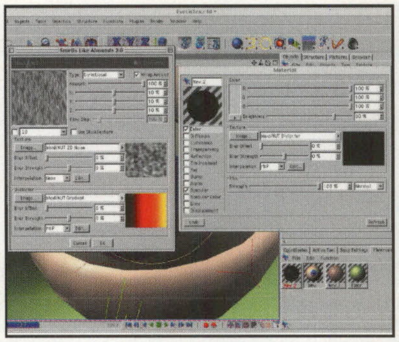
6 The colour borders are too fuzzy but we can fix that by opening the Gradient properties again and dragging the Swatch tabs closer together in the Gradient bar. You can actually overlap them for a really crisp edge.

Part 4: Using nested shaders to add details

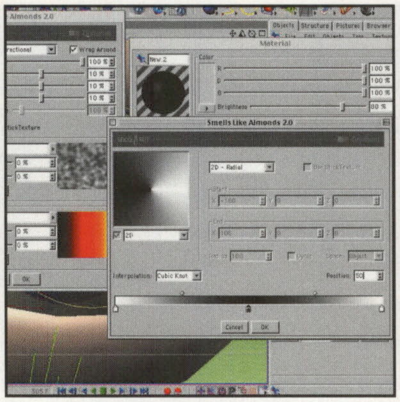
Time to add some radial lines to the iris by editing the gradient and Noise shaders. We'll also draw some veins round the edges

Expressions

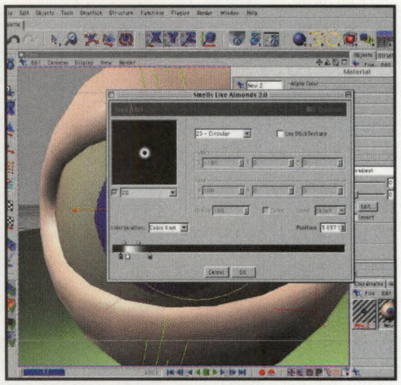
Expressions are scripts or mathematical instructions that you add to objects in a 3D scene that help to automate animation. Though it sounds a bit techy, using expressions can make the world of difference.



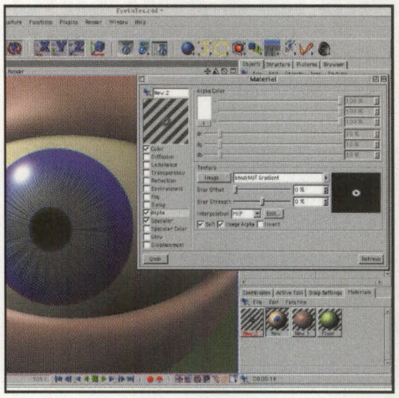
1 *SLA2*'s real power comes when you begin nesting the shaders to create shader 'trees'. We can use this feature to add some radial lines to the iris. Create a new material, and add the bhodiNUT Distorter shader to the Colour channel. Click Edit, and add the bhodiNUT 2D Noise shader to the Texture section, and the bhodiNUT gradient to the Distorter section.



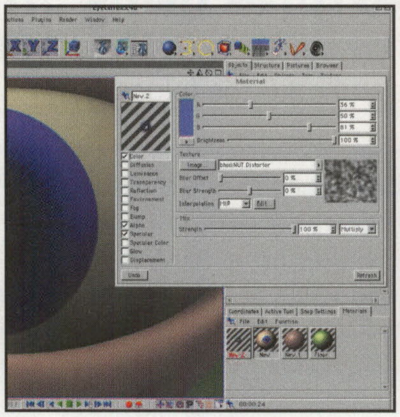
2 The Distorter shader displaces an image or shader using another image or shader. So to create radial lines from the Noise we need to edit the gradient. Set the gradient type to 2D–Radial, and use a white iris distorted into a radial pattern.



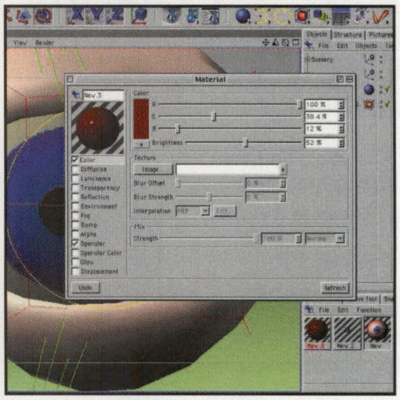
3 Click OK on the Distorter shader to return to the Material editor. Now we need an Alpha mask to place the Noise only in the iris area. Add a Gradient shader to the Alpha channel of the material and set it up like so. Drag the new material to the sphere, using the same settings as before.



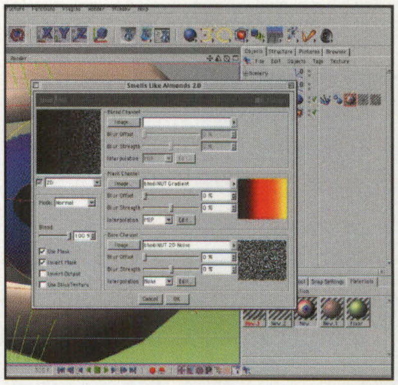
4 You'll need to test render and adjust the Alpha gradient to get the placement spot on. The problem at the moment is that the colours of the Noise are wrong. We want just the dark lines to show up overlaying the iris.



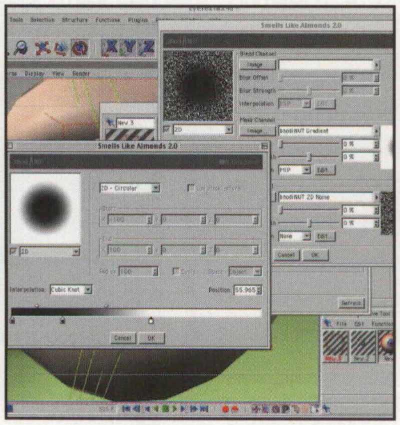
5 We can get this effect by setting the colour's Texture channel (which contains the Distorter and Noise shaders) to Multiply mode, and then setting the channel's main colour to a mid-blue.



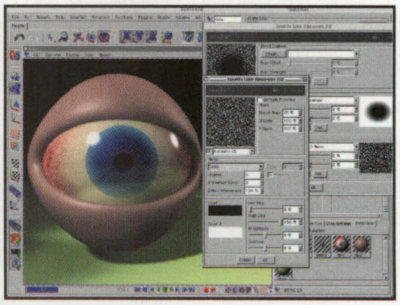
6 You can continue layering details with the *SLA* shaders as much as you want. We'll now add some veins to the outer edges of the eye. Create another new material and set the main colour to a dark red-brown.



7 In its Alpha channel, add a bhodiNUT Fusion shader and click Edit. Fusion lets you blend two shaders using a mask. We only need one shader but we can still use the mask. Add a 2D Noise shader to the Base Channel and a bhodiNUT gradient to the mask (after clicking the Use Mask checkbox).



8 Edit the gradient to create a circular mask like we have done before. This is to make the veins appear only around the edges of the eye. Use the Invert button if need be.



9 Click Edit on the Noise shader and set the noise type to Sema from the pop up list. You'll also need to reduce the Global scale to about 35%. Click all the OK boxes and drag the new material to the eye sphere (set x scale to 50% as before) and test render. Though the end result is cartoonish you can see how powerful the *SLA* shaders are, and with a bit of thought a huge variety of textures can be created directly within *XL6*. See the final file EyeTex2a.c4d on the CD. ca•s

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Rendering explained

Countless menu items and bizarre terminology compound the daunting nature of 3D rendering, but it's easier than you may think

3D rendering appears far more complicated than traditional mediums, and therefore very intimidating. When you launch a 3D program you are assaulted with countless menu items, buttons and sliders, all compounded by strange terminology.

The key to simplifying this ocean of confusion is to take one step at a time, rather than trying to master it

ustration: Jacey **Telephone:** 020 7636 1064 (Debut Art)

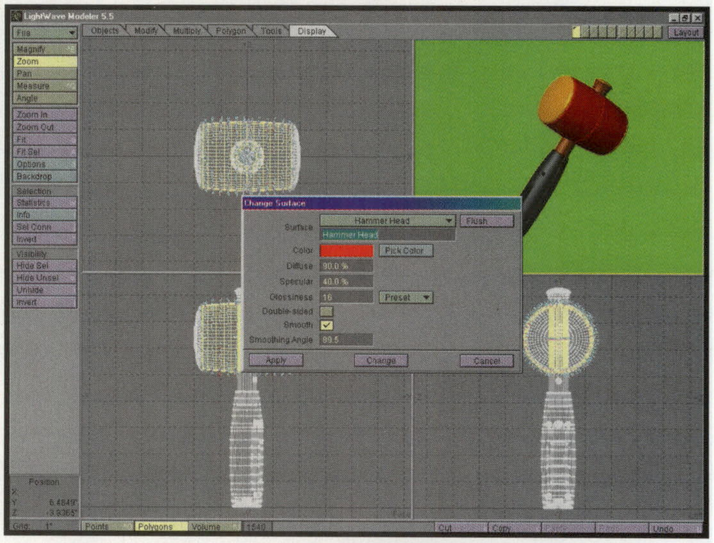
all at once. There are many elements to consider for each aspect of 3D graphics, but the process isn't so daunting when you learn them one at a time – it's still labour-intensive but simpler nonetheless.

For example, if you isolate the modelling portion of 3D you'll find there are fewer terms and tools to master. There are five major modelling methods (polygons, splines, NURBS, metaballs and metashapes) each with their own set of unique tools, as well as those shared with the other modelling methods. To master modelling, tackle one method at a time, then when you're comfortable with it, move on to the next until you've mastered them all.

Once you have a handle on the modelling aspect, you're ready to tackle rendering, which happens to have a number of unique areas that can be isolated, such as surfacing, lighting and rendering.

Over the next few pages we'll explore the rendering aspect of 3D, looking at each area and clarifying any confusion of the common tools and terminology found in every 3D program. While there are a wide variety of 3D programs, ranging from entry level consumer programs to the elite professional applications, they all contain the basic tools of 3D rendering that we discuss. Along the way we also explore some of the useful tools and features you should look for in a 3D program so you can render with optimal results. Unfortunately, not all 3D programs come equipped with all the features you'll need so it's as well to carefully review the features of a program before buying it. The last thing you want is to be saddled with a program that doesn't meet your needs.

Okay, let's get started with our exploration of 3D rendering. We'll start by taking a look at the first step in 3D rendering – surfacing.



Change Surface

Surface: Hammer Head

Color

Diffuse: 90.0 %

Specular: 40.0 %

Glossiness: 16

☐ Double-sided

☑ Smooth

Smoothing Angle: 89.5

A new surface is defined by selecting the desired polygons and assigning it a new surface name. The small blue lines showing the facing direction of the polygon represent the selected polygons.

Surfacing

Once you have created your model, regardless of the modelling technique used, you're ready to render it, but first you need to apply surface attributes such as Color, Bump, Specularity, Reflectivity and Transparency, which combine to create the visual appearance of the surfaces – hence the term 'surfacing'.

Some 3D programs refer to surfacing as texturing but this is incorrect because a texture is in fact the property of a surface that you can feel. It's the grain of wood or the rough texture of sandpaper, but not the colour.

As you delve deeper into 3D rendering you'll discover that there is no real standard of terminology in this industry, and the few common terms that have been adopted are typically incorrect. It's a young industry with many players developing rendering software so terminology is going to be a sticky mess for many years to come. In time you'll come to understand the many different ways of expressing the same tool or technique. It's like speaking several different languages. The best way to alleviate confusion is to focus on what the tool does, not what it's called. The functions of the tools are fairly consistent across most programs even if the nomenclature isn't.

Defining surfaces

Before we can apply surface attributes to the model we need to assign unique surfaces (also called materials). Some models may only have a single surface such as a battery, while others like characters, will have multiple surfaces. The ease with which you can assign surfaces changes from one program to the next. Seek out a program that enables you to simply select the polygons, Spline patches or NURB patches that you want to transform, and give them a new surface name. It sounds simple but some programs have made the process challenging.

We need to assign new surfaces for each area of the model that will have a different attribute. In the case of the hammer toy prototype (pictured above), the head of the hammer, striking surface, neck and handle all have unique material properties so they need unique surfaces. We'd want the colours to change on each part, as well as the surface properties since some parts are plastic and others rubber, not to mention some metal screws.

Once the surface selection is created, the surface attributes can be edited. The attributes of a surface are often referred to as Channels. The main channels of a surface are Color, Luminosity, Specularity, Reflectivity, Transparency and Bump. These

Surface channels

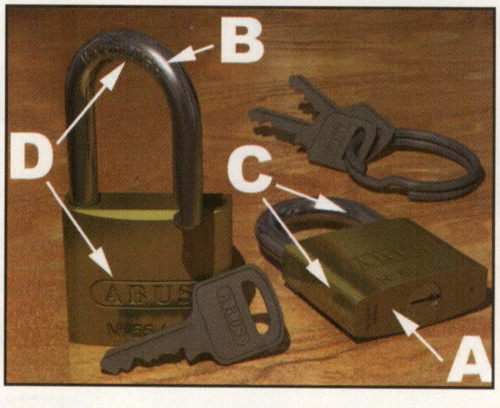
The Surface channels are used to determine the appearance of the object material. The intensity (opacity) of each channel, except the Colour channel (which uses RGB colour values), is controlled by values from 1-100. For example, in the Bump channel, the value determines the altitude of the Bump effect.

A Colour
The Colour attribute determines the actual visible colour of the surface. It's as simple as that.

B Specularity
Specularity is defined as the reflection of a light source on the surface. It's that little white spot you see on shiny objects commonly referred to as the 'Hot Spot'. Most man-made objects in reality have some form of specularity as a result of the material they are made of. For example, plastic objects have a moderate to high level of specularity because they are hard and shiny. The Specularity attribute controls the brightness of the Hot Spot. There is a sub-attribute of Specularity called Hardness that controls the actual size of the Hot Spot.

C Reflectivity
Reflectivity is the attribute that determines how much of the environment the object's surface will reflect. Reflectivity mirrors the environment on the surface of an object. Common reflective surfaces are metal, plastic and any other surface that might be polished or wet. Water is very reflective, so wet objects also become reflective.

D Bump
The Bump attribute gives your surface physical texture: something you could feel if you touched the model. The Bump attribute raises or lowers details on the surface depending on your settings.



There are two ways to edit these channels. You can use the simple numeric values if you want a basic single colour surface, for use in a cartoon environment, or you can add more detail with Procedural textures and image maps (often called textures).

channels create the visual appearance of your surface.

Procedural textures

Procedural textures are mathematical algorithms that create random details on the surface. These can be changes in colour as well as changes to all other channels. The most common Procedural texture is Fractal Noise, which is nothing more than random chaos, very similar to the Rendered Clouds Filter in *Photoshop*. These Procedural and Noise, textures can be combined on layers to produce very dramatic results. The picture on the right shows an example of a complex Procedural texture created using several layers of Fractal Noise.

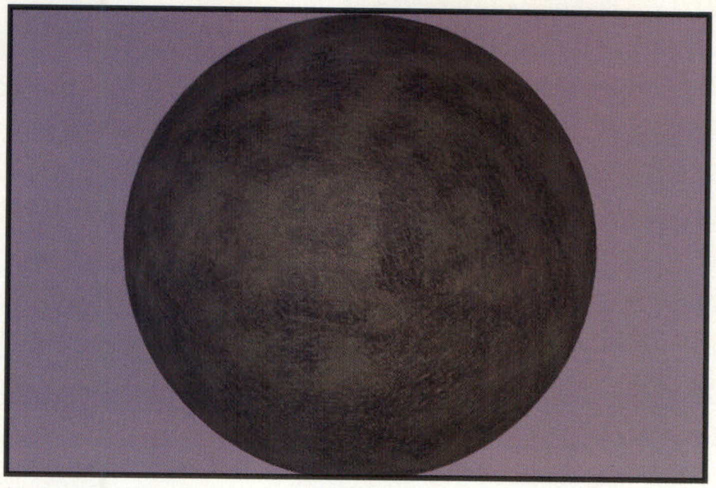
It's possible to create very realistic surfaces with Procedural textures since they are very flexible. A simple Fractal Noise can be edited to become countless unique textures by changing the scale, repetition and by introducing random seeds, which are random variables to create chaos.

One main benefit of a Procedural texture is that details won't be repeated since it's a mathematical texture. An image-based texture simply repeats the image, which can look very artificial.

Some programs have powerful Procedural textures that allow you to create incredibly realistic textures such as rock, metal, woods, skins and even complex industrial and sci-fi textures. The spaceship graphic on page 34 shows an image completely surfaced with Procedural textures, right down to the riveted panels in the tunnel walls.

Of course, the tools for editing the Procedural textures can range from simple to awkward. You want something that gives you a wide variety of pre-defined Procedural textures to edit. Building them from scratch can be extremely time-consuming.

Procedural textures do have their strengths but if you are seeking a more specific, exact texture you'll want to resort to image mapped textures.



A worn, scratched Procedural texture made by blending several Fractal Noise Procedural texture layers. One layer was compressed on the *Y*-axis to create scratch lines.

Image maps

The second method for surfacing is image maps. These are pictures, whether painted or photographs, applied to the surfacing using mapping co-ordinates. The mapping co-ordinates tell the program how the image is applied to the model. The three common mapping methods are Planar, Cylindrical and Spherical (see the boxout below).

These mapping methods are applied to one or all of the three axis (X, *Y* or Z) depending upon the orientation of your object. For example, a battery standing upright in the *Y*-axis would be surfaced with a Cylindrical image map on the *Y*-axis. In most programs you can interactively edit the exact placement of the image in *OpenGL*, which means you can see the texture move across the surface of your model as you edit it. Some programs still use a bounding box format for editing image map placement but this is far more awkward and should be avoided.

It's rare that a single image map can be used to surface a model. Most often you'll use several image-mapped surfaces to detail your models, particularly if they are organic. The graphic on page 34 shows a pumpkin model surfaced with image maps.

On the left of the graphic you'll find a depiction of how the textures were mapped to the model. There are two surfaces for the pumpkin skin – a Planar image map for the top surface and Cylindrical image map for the side surface.

Whether you are using Procedural textures, image maps or both, you can use Channel layers to blend several different textures to create more complex surface details.

This involves stacking textures and blending them using opacity (transparency) changes and in some cases layer blends like the ones you'll find in *Photoshop*. Some of the newer blends appearing in 3D programs are Multiply, Additive, Difference and Divide.

Channel layers are particularly useful if you're making a character. You would likely have one Colour channel layer for the skin and one for the red blush of the cheeks.

The blush layer can be modified to coincide with the facial expressions of the character. When they are made, increase the opacity of the blush layer to flush the face with red. Most 3D programs today offer Channel layers, though you should research any new product thoroughly to ensure it does.

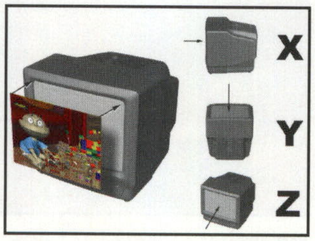
Channel layers are a must for creating detailed 3D surfaces. One other important feature of channels is the ability to animate the channels. In the case of the blushing face you'd want to be able to animate the opacity of the blush layer over time so you can increase the intensity with changes in the characters' emotions. Once you have a fully surfaced model you're ready to light your scene and render it.

Rendering styles

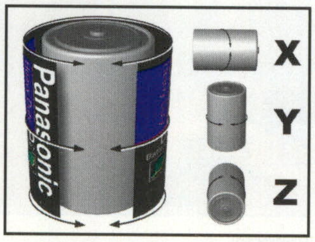
Most 3D programs provide a variety of rendering styles. The most common

Mapping methods

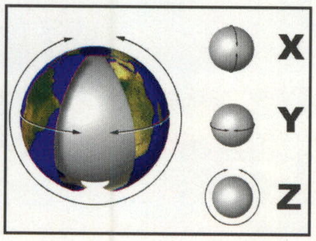
Mapping methods tell the program how a picture is applied to a surface. It's like the technique you'd use to wrap a gift box, ball or tube with paper. Mapping methods tell your program how the picture will be projected on the surface of the model. The three most common mapping methods are Planar, Cylindrical and Spherical.



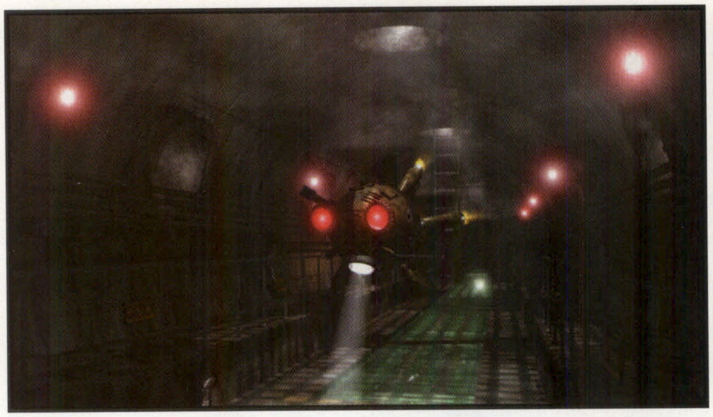
Planar image maps are the most frequently used image mapping method since the majority of objects have relatively flat surfaces. A Planar image map projects the image on to the surface of the object in the same way that a movie projector displays an image on the screen. For this reason, it's best to use Planar image maps on flat surfaces like TV screens, boxes and so on.



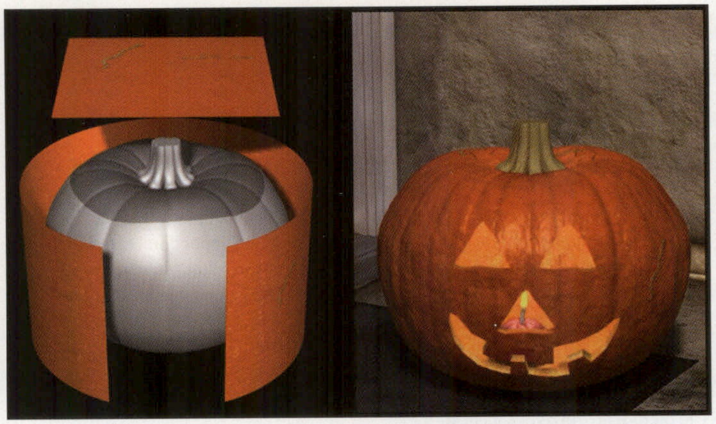
Cylindrical image maps are frequently used to surface tube-shaped objects. A Cylindrical image map wraps the image around an axis the same way a soda can label is wrapped around the can. Cylindrical image maps are great for surfacing objects like soda cans, batteries, tree trunks, baseball bats or any other cylindrical object.



Spherical image maps are probably the least frequently used image mapping method. This is mainly because they tend to pinch the image map at the top and bottom of the surface. This is a by-product of the mapping process. A Spherical image map wraps a flat image around the object in similar fashion to gift wrapping a basketball.



An image surfaced entirely with Procedural textures.



A pumpkin model surfaced with a Planar image map for the top and Cylindrical map for the sides.

styles are scanline, raytraced, radiosity, cell shaded (cartoon) and sketch, though scanline has become a thing of the past with faster computers. Scanline was a rendering mode where reflections and shadows were faked to reduce render times. This style isn't used much any more since computers are quite fast and viewers are more demanding.

Of the remaining render styles, raytraced and cell shaded are the most popular. Raytracing renders true shadows and reflections. It takes a great deal more maths than a scanline render but the improvement in quality is well worth it. The cell shaded render style creates the classic cartoon animation style with solid colours and sketches outlines. This is becoming a much more popular style in 3D since it has classic roots. It's also much easier to accomplish since there are generally no textures involved.

Regardless of which render style you choose they don't require much setup. In most cases they are pre-defined, so all you need to do is press a button to make the change from one to the next.

When you are selecting a 3D program it's a good idea to take a close look at the render styles offered and also how much control over them you have. You don't want to back yourself into a corner with a program that doesn't allow you to modify the render styles. For example, you may want a Cartoon style but without the sketch lines. You might also want to blend a photo-realistic object in your cartoon world so your program would need to allow you to blend render styles. This means the render style would need to be associated with the object rather than the global scene.

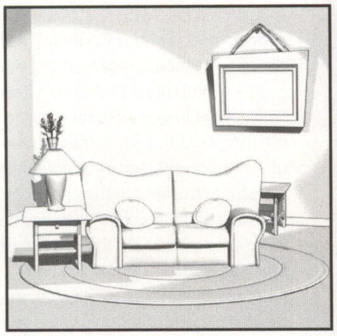
Wrap up

Rendering is like building a house of cards. Once you've mastered the basics, building a bigger house is really a matter of patience and commitment — the two factors that separate amateurs from professionals. Pros don't necessarily know more about 3D - they are just more persistent and press on after the point where they are inclined to stop. The difference between a simple 3D image and an extraordinary image is simply the amount of time invested.

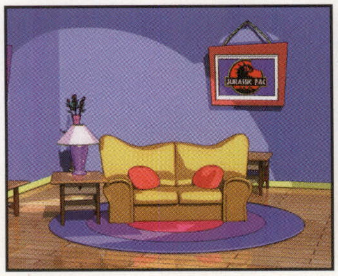
Modelling a cartoon character requires the very same techniques as modelling a photo-realistic creature: the creature just requires more time and patience. The same applies to surfacing, lighting and rendering. It's no walk in the park but it doesn't have to be a nightmare either: just take it one step at a time. Once you've mastered an aspect of 3D keep pushing yourself to do more with that knowledge.

Render styles

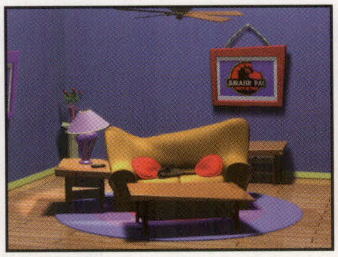
The simple press of a button can radically change the outcome of your rendered image. Most 3D programs come with several render styles pre-defined. While you can customize them, the defaults will give you dramatic results at the press of a button. Here, the same image has been rendered with four different styles to produce a wide range of results.



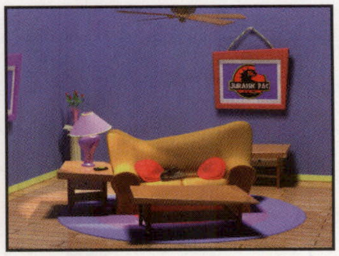
Sketch
The Sketch render mode renders your scene to resemble a pencil sketch with irregular lines defining the major features of your models. It's pretty much what you'd see in the initial sketch phase of a cell animated movie or TV shows.



Cell Shaded
The Cell Shaded, often called 'Cartoon' render mode makes your objects look like cartoon cell animation. The objects are given outlines as with the Sketch render mode, then they are filled with solid colors, or even textures. Depth is simulated on the models by use of colour banding, in a similar way to traditional cartoon cell animation.



Raytraced
The most popular rendering method is raytraced, which means the light rays are computed to render accurate shadows and reflections. This is a realistic render mode where objects appear more realistic and certainly more dimensional than with the two previous render modes. Raytraced is a fairly fast and efficient means for achieving photo-realism with your rendered images.



Radiosity
Radiosity is the most accurate rendering method because it takes into account reflected light. When a bounced light hits another object it will change the colour of that object's surface, though the effect is typically very subtle. Since radiosity computes reflected light, along with the colour changes of that light, it involves a great deal of maths, making it an extremely time-consuming.

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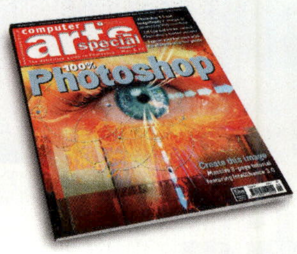

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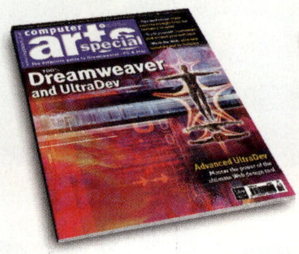

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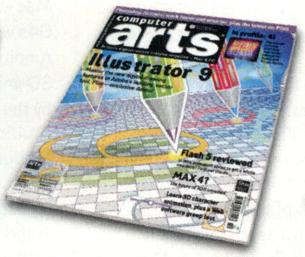

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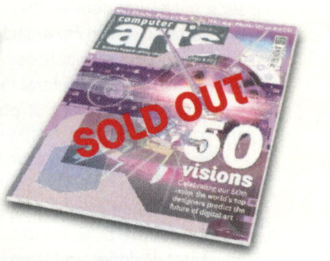

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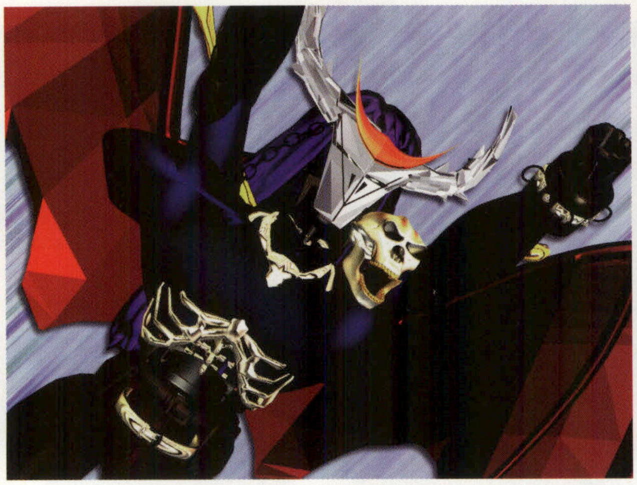


1

Renga Media

There's a new wave of UK anime, and it's kicking off in Brighton. Renga Media's style is manga meets 2000AD. The result?

"Brit-manga of course. Living, breathing comic books..."

Regular readers of *Computer Arts* will have already come across Renga Media on the letters pages of issue 49. The 'star letter' is written by Tony Luke, co-founder of this 3D animation studio, who writes: 'Money can buy fabulous results, but it's the ideas that dictate whether a product sells, not how expensive the software was that made it. We started out with *Poser* and *Bryce*, pushing them way beyond their limitations...' This determination to rise above has been central to Renga's success, driving it through the 'Starting Out' phase, and landing it well and truly in that titled 'Accomplished and Flat-out'.

Renga is a Japanese-sounding name, and a clue to the company's style. "Everyone has a background in comics and animation," Tony explains. "Alan in scripting Judge Dredd, Nirasawa as a PlayStation character designer, and Liam in *Spawn* and *X-Men*." The guys can be found in Brighton, wrapping up two 90-minute movies. Currently in production is *Dominator*, due to be broadcast in the UK next year, and in 2001 we'll also see *Tyra 69*. Both are targeted at the Buffy audience, and expect to hear the voice-overs of numerous celebs...

"The core group is Liam McCormack-Sharpe, Dan Woods and myself," Tony adds. "I run the show with backer Jim Brathwaite of XL Entertainment, liaising on script matters with Alan Grant and top model-maker Yasushi Nirasawa. We're really pleased with the way it's going..."

Which isn't too surprising, seeing as things are going from strength to strength. The company started out in 1993 as Renga Studios, when Tony was working in the manga industry. "*Dominator* had been published by Kodansha, and I joined forces with Alan Grant to reproduce it as a colour strip for the Japanese market, with sales peaking at over a million." On the back of this came Renga's first major project, *Archangel Thunderbird*, aired on the Sci-Fi Channel in 98. "Work has been non-stop ever since."

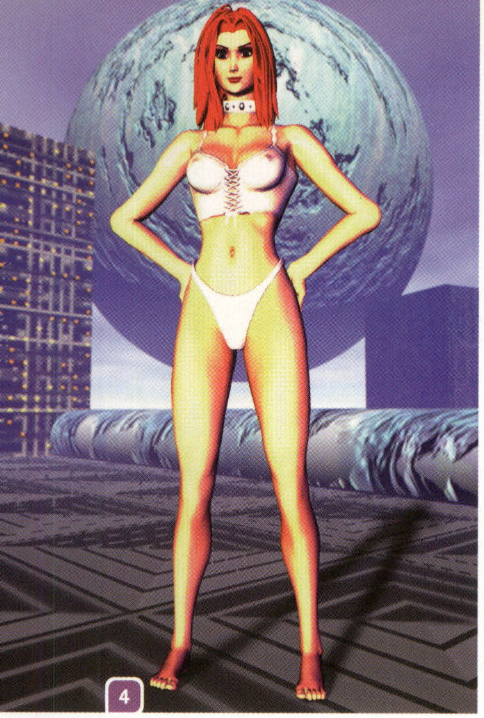
The hardware set-up behind this prolific output is Mac-based, with Brit-manga hatching on 500MHz G4s with 256MB RAM, plus a lone Pentium III PC running 3DS. When it comes to software, it's easy for 3D animators with less-padded wallets to be deterred by the view that only high-end apps like *Maya* and *3D Studio MAX* equal professional design. But for Renga Media, this is 'software snobbery'.

"*Poser* may be low-end, but it can't be beaten for fast design and keyframing. We use it with *MAX* and *LightWave*. The same goes for *Bryce* - gorgeous results with no fuss." Add to this list *Strata Vision* (Liam's favourite: "It gets overlooked in 3D modelling circles, but I can't praise it enough!"), *Amorphium*, *After Effects*, *Photoshop*, *Premiere* and *Commotion*, and you have Renga's full software stable. "There's a lot to learn," Tony recalls, "but trial and error is the only way."

Right now, it's more trial than error. "There's so much on the go," Tony begins. "RengaTV for a start, an Internet channel due to launch next year. We're also creating animated backdrops and sites for clubs and bands like the Cradle of Filth, and working on PlayStation versions of our characters. Oh, and our Website will soon be running *Flash* comics..." **ca▸s**

You can contact Renga Media on **[e]** rengamedia@aol.com. For more info, movie trailers, or to download comics and streaming videos, head to **[w]** www.rengamedia.com
You can also find a showreel on the cd. Called RengaPromo.mov, it's in the Movies folder in the root directory.

2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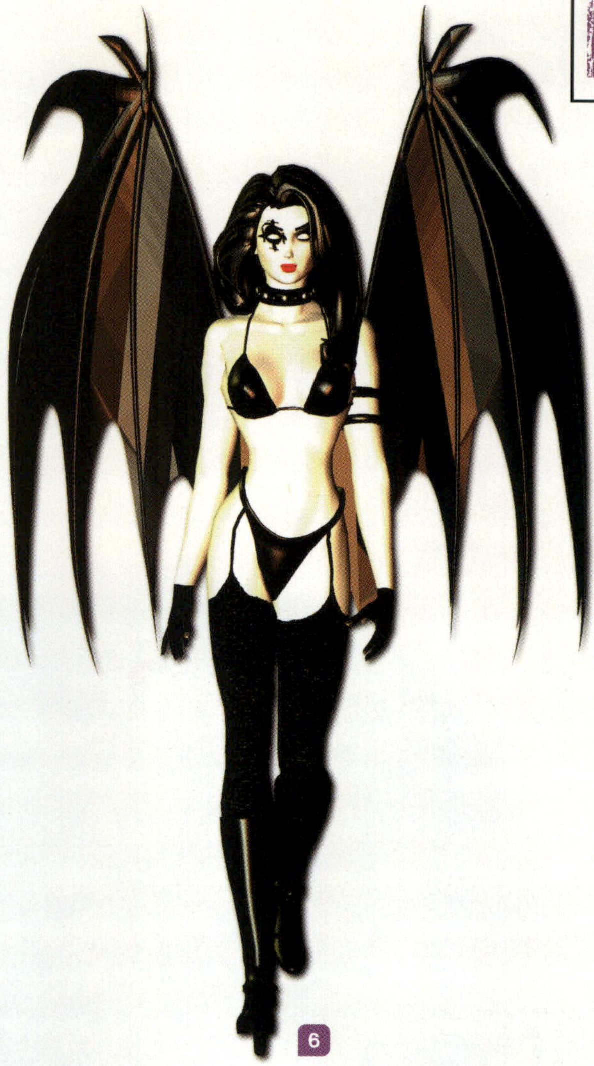
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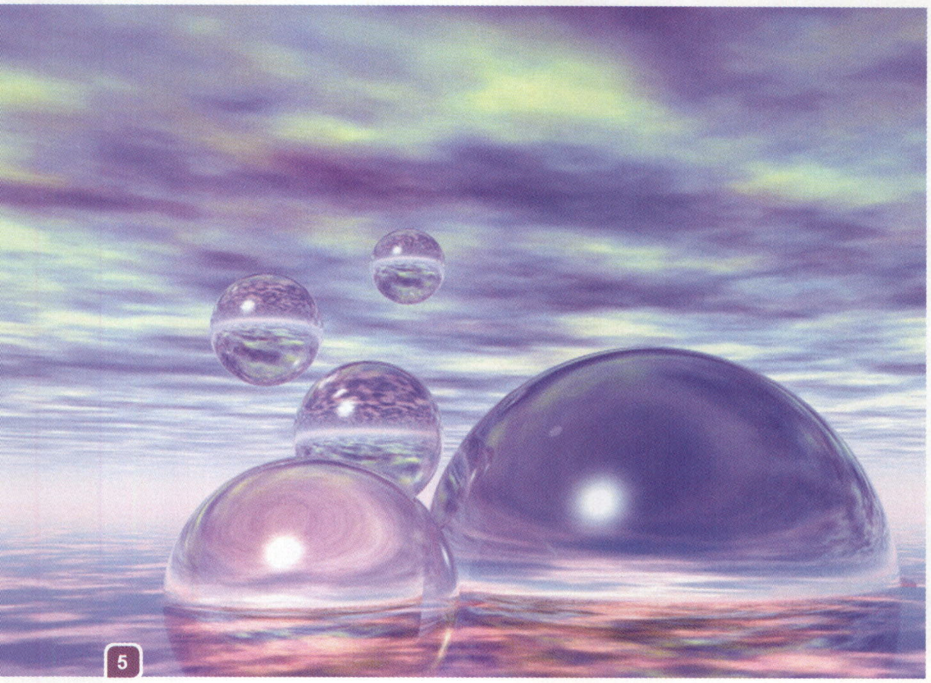
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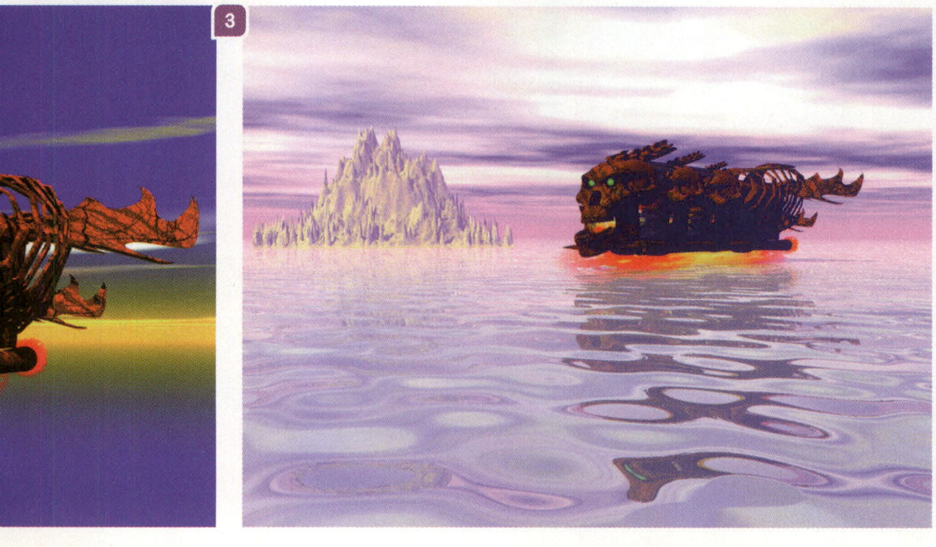
3

1. This is the flagship character of the *Dominator* movie, primarily constructed in *Poser*, with imported objects brought in from *Strata* and *Pixels* to finish it off. Liam McCormack-Sharpe made the mask using *Strata*: "It took a week of sleepless nights!"

2. Tony comments on *Dominator*'s most demanding lady: "The hair is fully jointed, and she needs a minimum of 300MB of RAM before we can start to animate her! Yasushi Nirasawa designed the character - we scanned his original art and built a Texture map for a 2D/3D style. Our most complex *Poser*-ette by far, she's a good example of what the app can do. *Poser*'s facial expressions settings are fast, and give excellent results."

3. These images are taken from the upcoming *Dominator* animated movie, as Tony Luke explains: "The model was built in *Bryce* using primitives and imported objects modelled in *Pixels 3D*, and was composited with backgrounds built in *Bryce* using *After Effects*. The shot was completed with the addition of fiery rails that appear beneath the train when it's in motion - these were animated in *After Effects* using *Pyromania*."

4. Meet cyborg mercenary Tyra 69, the star of her own movie currently in production. She was built in *Poser*, using a manga-style body available from Zygote. The environment was again created in *Bryce* and composited in *AE*. "A very, er, physical character, this one," adds Tony. "So the bones were enhanced to give her motion capabilities." See the trailer over at **[w]** www.rengamedia.com

5. Constructed in *Bryce*, this is part of an ongoing project supplying live dance events with animated visuals. This one demonstrates the more ambient end of the scene. "At least one of the G4s is always ticking away on this project. We're now supplying visuals and projections for musical events, ranging from opera to full-on death metal."

6. Star of her own strip back in the mid-90s, Hellkatt is now part of the *Dominator* cast. "Again using Zygote's manga model as a template, she's a good example of what *Poser* can achieve," says Tony. "It's important to avoid *Poser*'s traditional character look - careful lighting and tweaking in *After Effects* can create something completely new…"

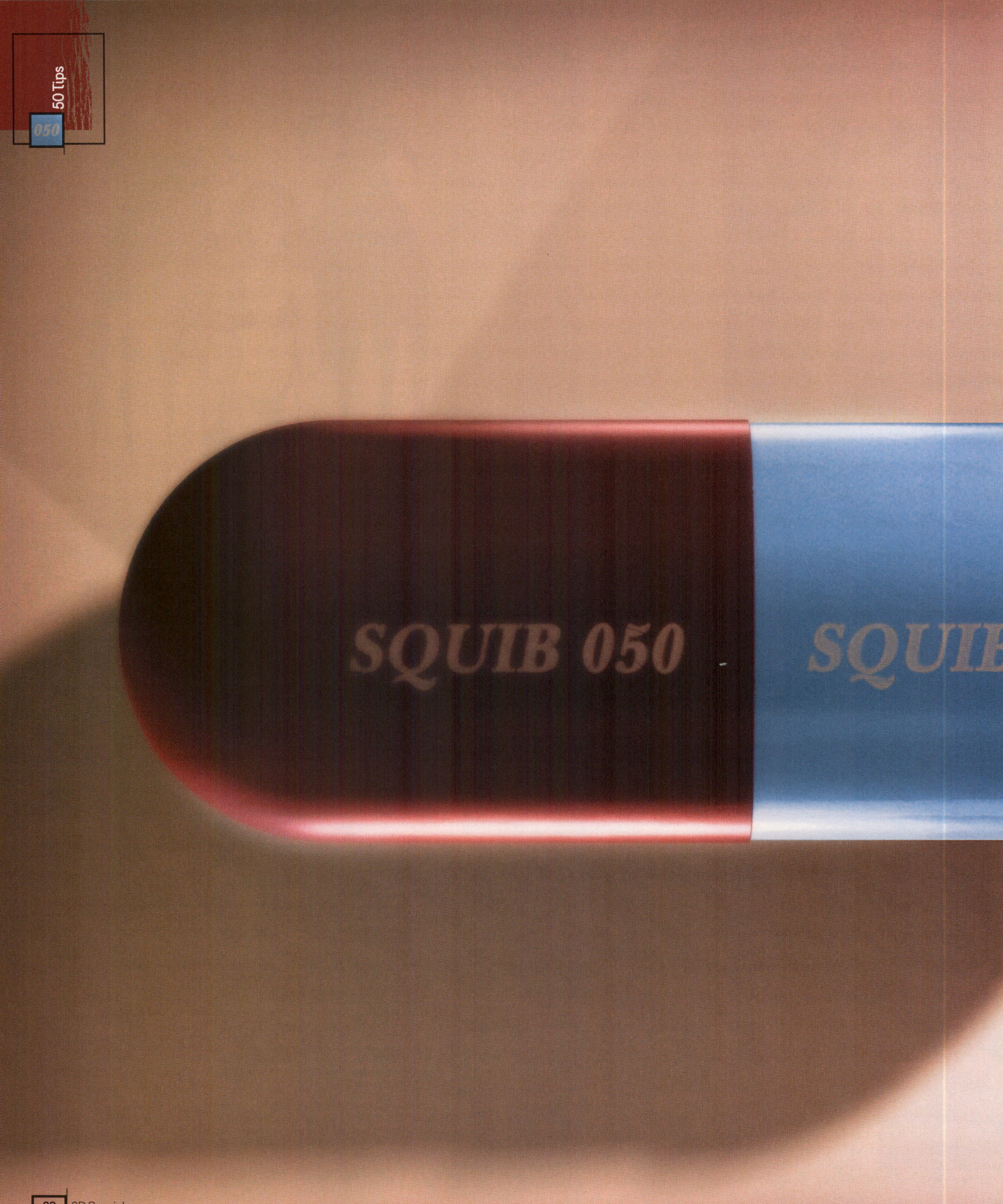
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Illustration: Simon Danaher **[e]** simond@naher.demon.uk **[t]** 01633 250828

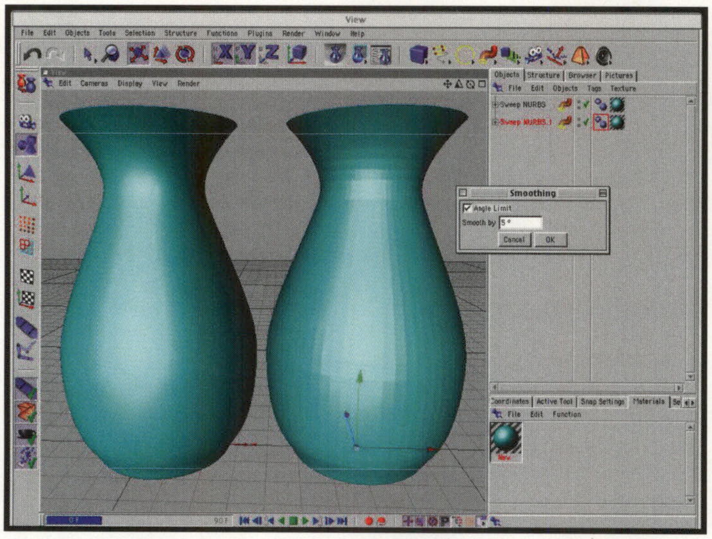
50 3D

tips for beginners

In a field as rapidly evolving as 3D, it helps to know a few tried and tested ways of getting results. We've compiled 50 tips that do the business

3D graphics can be exciting and fun but also daunting for the uninitiated. If you want to get into it, there's no better time than now, and to help you get the most from 3D we've assembled 50 tips covering subjects such as modelling, animation, lighting and rendering.

3D graphics have many uses from creating Websites to print design through to animation and effects for the big screen and TV. With today's computer hardware, fast processors and speedy 3D displays, using 3D programs has never been easier. The programs themselves have also become much easier to use, and even the lowliest 3D package is capable of creating fantastic imagery. So what are you waiting for?


View
File Edit Objects Tools Selection Structure Functions Plugins Render Window Help
Edit Cameras Display View Render
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Sweep NURBS.1
Coordinates Active Tool Snap Settings Materials
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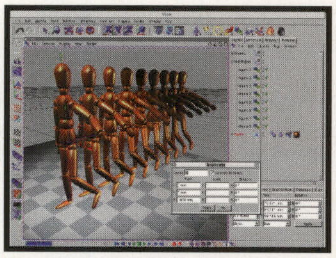
Smoothing
☑ Angle Limit
Smooth by 5°
Cancel OK

A Smoothing angle tells the renderer whether or not to smooth adjacent polygons on an object. The higher the angle, the more often smoothing occurs. A value over 90 degrees would smooth the edges of a cube, for example.



Rather than copying an object wholesale, use Instancing. Each instance of an object is simply a reference to the original not an actual duplicate.

Tiny bevels catch highlights and make for more realistic models.

Modelling

1. Model only what will be seen in the final image or animation. There's no point worrying about what's around the back of a model if the back will never be seen – although it can be difficult to stop if you find you're on a roll.

2. Likewise, don't make objects higher resolution than is necessary for them to look smooth at the maximum size they will be seen at. The higher the polygon count of a model the more memory it will take to render.

3. Heavy models (in terms of poly count) not only take more memory but are slow to display. When animating, it may be useful to supplement low resolution proxies for objects, or if you are using subdivision surfaces you can reduce the subdivision level or only view the cage object.

4. Rendering engines employ special shading algorithms (such as Phong, Blinn or Gouraud) to smoothly shade a model's surface even though it is made of flat polygons. The renderer interpolates the surface Normals so that there are no sharp breaks in colour, only smooth gradual shading. Using a Smoothing angle control you can define at what angle this smoothing takes place.

5. Most 3D programs utilise *OpenGL* for shaded display. Getting a fast *OpenGL* accelerator card makes all the difference when animating and modelling. Many games-oriented cards can be used for 3D animation, so long as they accelerate *OpenGL* and they don't cost the earth.

6. If your 3D program supports it, use instancing when duplicating objects. Instancing takes less memory than actually duplicating objects. The other benefit is that when you change the original object, all the instances update automatically.

7. Use the right tool for the job in hand. Polygons are great for intricate details while NURBS are ideal for smooth-flowing lines and surfaces. There's nothing to stop you from using both on a model if it is required.

8. Don't begin a 3D project blind – as with most things, a solid plan of action pays dividends. If you are producing an animation, take time to draw a storyboard. This doesn't have to be elaborate and you don't need to be a talented fine artist: a simple sketch helps you to decide on the camera angles, and tell you know what needs to be modelled.

9. Null objects are a special kind of object that are very useful in 3D programs. They are objects that have no associated geometry but have a location in space. You can link objects to Nulls to simplify certain types of animation or to provide a pivot point that is located away from the object.

10. Sharp edges on 3D objects look unrealistic and can also work against you when you're trying to light a scene. In reality no object has infinitely sharp corners, in fact most edges are rounded to some degree. Mimicking this in your models will not only make them look more realistic but the rounded edges will catch highlights and give your creations extra zing.

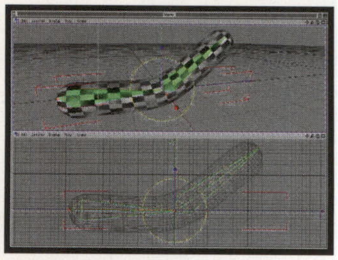
Animation

11. In most 3D programs the camera can be animated easily. Just because you can animate the camera all over the place doesn't mean you should. Often subtle, precise camera movements can improve an animated sequence. The exception is when creating special effects, otherwise over-exaggerated movement can be distracting.

12. Joints and bones are the key tools of character animation. Bones can be built into skeletons inside a character's limbs just like in a human body. A bone captures and deforms the vertices of the model nearest, so that, for example, two bones in an arm bend it at the elbow when the forearm bone is rotated.

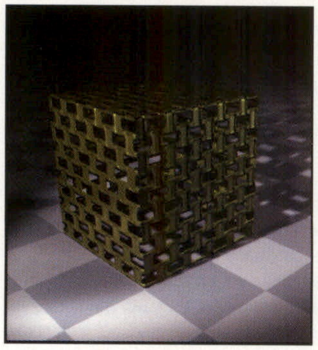
13. Kinematics is the science of motion. In 3D there are two types of kinematics, Forward and Inverse. Forward kinematics is when you rotate each object or joint in a model one by one to achieve the desired pose. Inverse kinematics only lets you move the end object in a chain, and the rest of the objects bend to follow it.

14. Often with an IK setup, rather than animating the last joint you define a Goal object. This can be any object such as a Null which the joint chain will try to reach at all times. The Goal can be animated freely or linked to another object for example to make a character look as though it is holding something.



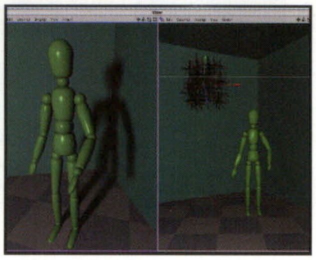
Bones are special deformers that can create smooth bends in a continuous mesh. They are ideal for use with characters but you can use bones any way you like.

47. Clip mapping



Clip maps are similar to Transparency maps in that they make parts of an object transparent. However if you use a Transparency map on an object to make it look transparent, you might get a shock when it comes to the shadow the objects casts since depth mapped shadows can 'see' the texture on the object. The shadow in this case would not have a hole in it. Clipping maps work as if a portion of the geometry had actually been removed, so that when the depth mapped shadow is calculated the hole is taken into account too. Clip mapping is also great for making models look more detailed. You could scan an image of a complex mesh or fretwork and use this as a Clip map to create an ornate-looking model with little effort.

48. Area light fake



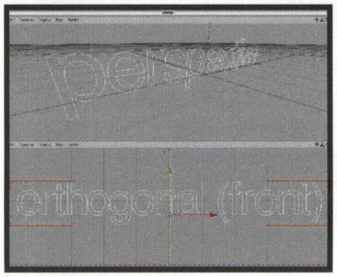
If your 3D program does not have Area lights, don't worry, there's an easy cheat. To simulate an Area light source and shadows, create a Point light and duplicate 10-50 times randomising the positions during duplication. Before you do this, however, divide the intensity of the original light by the number of duplicates you create, plus 1 to maintain the brightness. For example, if you want to create 10 extra lights, and the original intensity was 88%, set the intensity 88/11=8% before you duplicate. Also make sure that Raytraced Shadows is set for the light. When you render, the cluster of Point lights acts like an Area light. What's more the shadows are graduated like Area shadows are. You may find each shadow from each light is visible, but you can create a smoother shadow by increasing the number of lights in the cluster, while increasing the randomisation will make the cluster larger thus making even softer shadows and lighting.

15. Many 3D animators don't use IK for the arms of a character, relying on good old Forward kinematics, though they may still use IK for the legs. IK can be used when the character needs to hold something such as when climbing a ladder.

Camera & Views

16. Things to remember about the camera: dollying is when the camera moves in and out, tracking is when the camera moves from site to side (often following an object). Panning is when the camera rotates from side to side or up and down but doesn't move, while rolling means to tilt the camera around the axis of its line of site.

17. Don't get confused between zooming and dollying a camera. Zooming is when you change the camera's field of view lens which has an effect on the perspective you see from the camera. To get a close up view without changing the perspective physically, move the camera towards the objects in question.



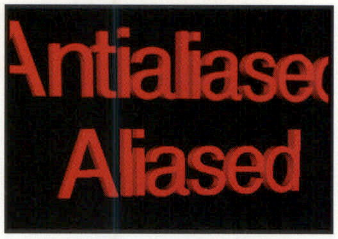
Here are Perspective and Orthogonal views. Orthogonal views are useful for making sure what you move or draw stays on the same plane.

18. You may find that zooming in and out and then using a Fit to View command causes the perspective of a camera to go haywire. If you don't have a reset button for a Camera view access the camera Properties and find the Field of View or Focal angle parameter. Set this to a more normal value such as 50 degrees then try fitting the view again.

19. There are two main types of view in a 3D program, Perspective and Orthogonal. The Perspective view is intuitive and similar to what you would see through a camera. The Orthogonal views have no perspective and are more like a plan or elevation of your scene. This makes it very easy to align objects using the top, side and front Orthogonal views.

20. There may be an occasion when you want to render an Orthogonal view but your 3D program may not support this option. You can turn any 3D camera view in to an Orthogonal view (or near as dammit) by dollying out as far as you reasonably can then zooming in until the scene is framed as you want it. The view is still in perspective but the effect is so slight as to be invisible.

21. Gimbal lock is a common problem with cameras in 3D. If you rotate a camera 90 degrees in Pitch so that it is pointing vertically down, rotation in Heading and Bank result in the same motion. To remedy this, parent the camera to two Nulls and use one for animating in Pitch, the other for animating in Heading while the camera can still be used to bank the view.



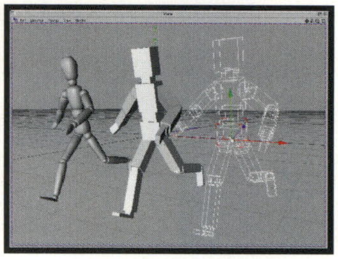
The lower text is not antialiased and has jagged edges, but the top text has been antialiased and has smoother edges with no jaggies. Though antialiasing takes longer to render, it's essential for quality output.

Rendering

22. Antialiasing is a method for reducing the jagged edges you find in a rendered image. In order to smooth out these edges, the program must render extra information for each pixel, then average the result to get the antialiased pixel. Antialiasing an entire image can be very time-consuming and inefficient since only areas of high contrast exhibit aliasing. To speed things up, enable 'adaptive antialiasing' if your 3D program supports it.

23. Sometimes rendering smaller than required and blowing up the animation in a compositing program can produce a softer look. It's ideal for underwater shots and takes less time to render.

24. For print work, high antialiasing can cause the image to be too soft. The options here are to use sharpening in your image retouching program or use adaptive antialiasing with a setting that only enables antialiasing for the most severe areas. You can also get away with a much lower antialiasing level for print than with an animation.



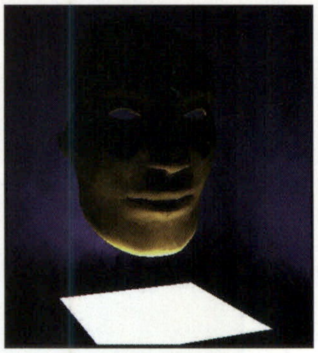
For motion tests, using a lower quality rendering method such as wire frame or bounding box saves time and lets you see the motion just as well as a fully shaded render.

25. For animations it's best to use motion blur when there are rapidly moving objects. Even if you are rendering using fields (for video), motion blur can still help to create a more natural smooth look to animations.

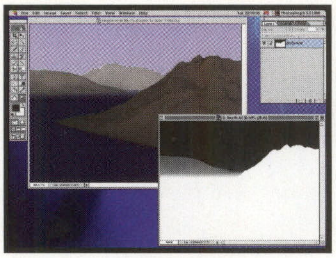
26. There are three types of motion blur. 3D raytraced motion blur (available in high-end systems such as *Maya* and *Mental Ray*), multi-frame motion blur and motion vector blur. Motion vector blur is fast and efficient but not all systems have this option. Multi-frame motion blur is easy to implement but requires each frame to be subdivided and rendered from five to 25 or more times. It's recommended that you enable multi-frame motion blur only for the frames of an animation that require it.

27. Raytracing is expensive time-wise, so use it sparingly or better yet not at all. Many reflective objects can be simulated using a reflection map instead. This is an image used for reflections and works well for objects that don't require detailed scrutiny in a scene.

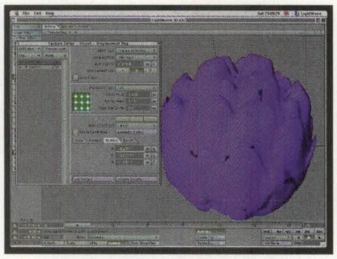
49. Radiosity lighting



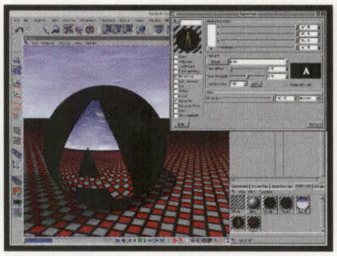
Radiosity rendering is powerful and realistic. It can calculate the lighting of a scene taking into account the bounced light for objects. Using this knowledge you can actually light a scene without using any lights. In this image the lighting is from a surface which has a luminosity of 1000 per cent. There are no other lights in the scene only the luminosity of the surface that is illuminating the other objects which creates a realistic lighting effect. Notice that the walls are illuminated by light that has bounced off the face model, since near to the 1000 per cent luminous surface the face itself is very bright. Note that the blotchiness of the render is because of the low quality setting of the radiosity solution – this keeps the rendering time down.



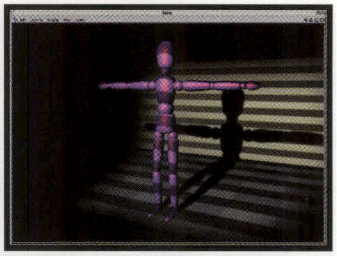
A depth render can be used to post -process an image. Here it's used as a mask to add a haze effect to this scene.



A texture can be used to displace a model's geometry and can be used as an extension to modelling. Here a dot's texture is used to displace this sphere.



Textures can be used to 'mask' properties, or modulate their intensity. Here a texture is used in the Reflection channel to control the reflectivity of parts of the surface.



Here a 'Gobo' is used on a light to simulate off camera objects, in this case a Venetian blind. It's simply a texture of horizontal lines.

28. When test rendering motion, render using the simplest method that your program supports, such as wire frame or even bounding box. You'll get a good idea of the motion without being distracted by the look of the render, and you'll save acres of time.

29. When you render the final animation don't be tempted to render to a movie format. While this is fine for text rendering, always render to a series of sequentially numbered image files. If for some reason the program crashes or a plug is pulled during a final render to a movie file all the rendered frames will be lost. If you render to an image sequence, then each rendered frame is safely saved to a file.

30. Alpha channels can be rendered along with the RGB output of a scene. The Alpha channel consists of a black background with all objects showing up as white. This can be used to allow you to composite the objects in a 2D paint program such as *Photoshop* on to any other background.

31. Some 3D programs let you render a Depth channel. This renders all objects in the scene in shades of grey depending how far each is from the front of the scene. This file can be use as an Alpha channel to produce post render special effects such as fog or depth of field blurring.

Texturing

32. Some programs feature procedural textures which are mathematically generated within the program. You may want to use these in a different program, but how? You can turn procedurals into image maps by simply applying the texture to a plane in the Luminosity channel of its material and rendering an orthogonal view of it head on.

33. Water can be tricky to create but to make a body of water like the sea is to overlay multiple cloud or 'crumple' textures in different directions. Using a Displacement map and a high resolution polygon mesh for the water surface can also help with the waves.

34. Bump maps are crucial in 3D. They provide an object with the fine surface perturbations, nicks, cracks and dents that would be difficult or impossible to model by hand. The bumps are only calculated at render time and don't affect the actual geometry.

35. Bump maps aren't good for creating variations of an object's profile. No matter how high you set the Bump value, the edges of an object always appear smooth.

36. Displacement maps are like Bump maps except they are used to disturb the vertices of the geometry. Unlike Bump maps, a Displacement map affects the object's profile because the geometry is being distorted. Most systems require an object to be heavily subdivided for displacement mapping to work correctly.

37. An object's material consists of a number of property 'channels' such as Colour, Specularity, Diffusion, Reflectivity and so on. Image maps can be placed in these channels to control their effect, for example, a Grayscale image of a white letter 'A' on a black background in a Reflectivity channel would cause only the parts of an object covered by the 'A' to be reflective.

38. Most 3D programs let you use movie files or images sequences for textures. This is useful for creating a playing television screen, or animated water and limitless special effects.

Lighting

39. Many programs let you define whether a light contributes Diffuse and Specular illumination. By turning off the Diffuse option for additional lights in a scene you can add highlights to objects wherever you want them without affecting the scene illumination.

40. Many 3D programs support negative values for a light's intensity (though they may not always tell you so). Negative lights cast darkness rather than light, which is an odd concept yet they can be extremely useful for controlling light spillage and for darkening areas that are over-illuminated.

41. Volumetric lights have visible cones, like a torchlight beam in a dusty room. Objects in the path of Volumetric lights can also cast shadow 'rays' through them, which are particularly dramatic for logos and titles. A good example of this effect is the *X-Files* logo.

42. Be careful when using Spot lights and depth mapped shadows. To be efficient,make sure that the objects you wish to light are contained within a good proportion of the Spot light's cone. If they're not, then the shadow will appear blocky or fuzzy requiring you to increase the shadow buffer, which in turn will require more memory.

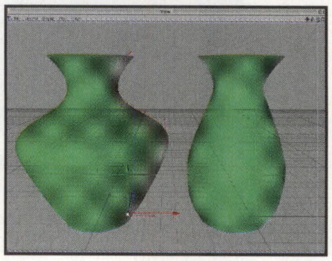
43. Many 3D apps let you view the scene through a light source. This is very useful when it comes to aiming Spot lights and for checking the size of objects within the shadow buffer.

44. Texture maps can be applied to light sources for some interesting effects. These 'gobos' can be used to simulate off-screen shadows of objects which haven't been modelled, such as Venetian blinds or branches of a tree.

45. If your 3D program does not have radiosity you can easily fake it with some clever lighting tricks. Six large Area lights can be placed at the four walls, floor and ceiling of a room to reflect back onto the objects within and simulate the light.

46. Ninety per cent of the time it is advantageous to enable Falloff for lights (except the sun). This is usually not enabled by default so you have to turn it on manually. Lights in a computer, unlike real lights, will illuminate infinitely far unless you tell them not to do so. By enabling Falloff you will find that you get a richer image. ca>s

50. Hierarchical modelling/construction history



It used to be in many 3D programs that when you created a 3D object from one of more curves, the curves were no longer needed. These days many 3D apps use construction history (also called hierarchical or relational modelling, dynamic modelling and so on) whereby the 3D surface retains its link to the generative curves or profiles. This makes visualising and experimenting with shapes more intuitive. You don't need to continually test the outcome of the Extrusion, Lathe and so on, delete the 3D shape if it's not right, tweak the profiles and regenerate the 3D shape. With construction history you just need to perform the operation on the profiles (Extrude, Sweep, Lathe and so on) then edit the profiles. The 3D surface generated by the curves updates as you make changes.

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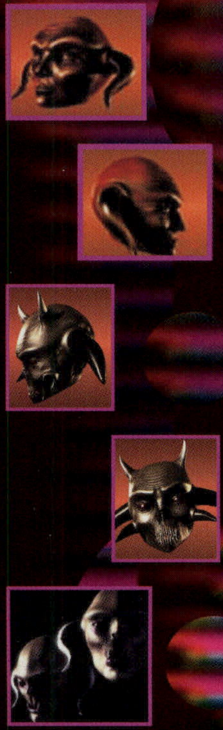
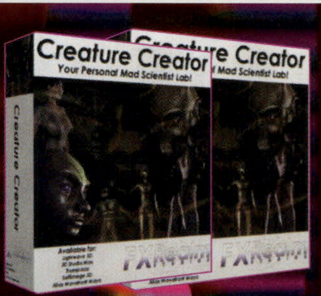
Creature Creator is a plug-in for 3DStudio Max, Lightwave/ Inspire3D, Maya, Truespace and also available as a standalone version.

For more information:
DISTRIBUTORS WORLDWIDE / SALES
sales@fxrealm.com
www.fxrealm.com
SEE COVER CD FOR DEMO

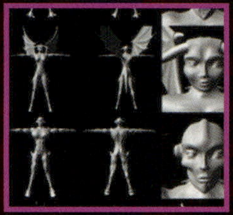


Creating humanoids, aliens, monsters, bugs and other things that go bump in the night is an easy experience with Creature Creator. Make one-of-a-kind characters for cartoons, fantasy and sci-fi in minutes - by using any of the plug-in's library of over 500 pre-defined body parts, which can be tweeked or combined in endless ways for genuine originality. If you're serious about your animations, you'll want to add Creature Creator to your toolbox.

"Creature Creator enables you to easily make 3D versions of the kind of weird and wonderful monsters normally seen lurking in episodes of the X-Files"
Computer Arts Magazine October 1999



meneco
Safe Harbor Computers
oak corporation
A&A



Buy the stuff you don

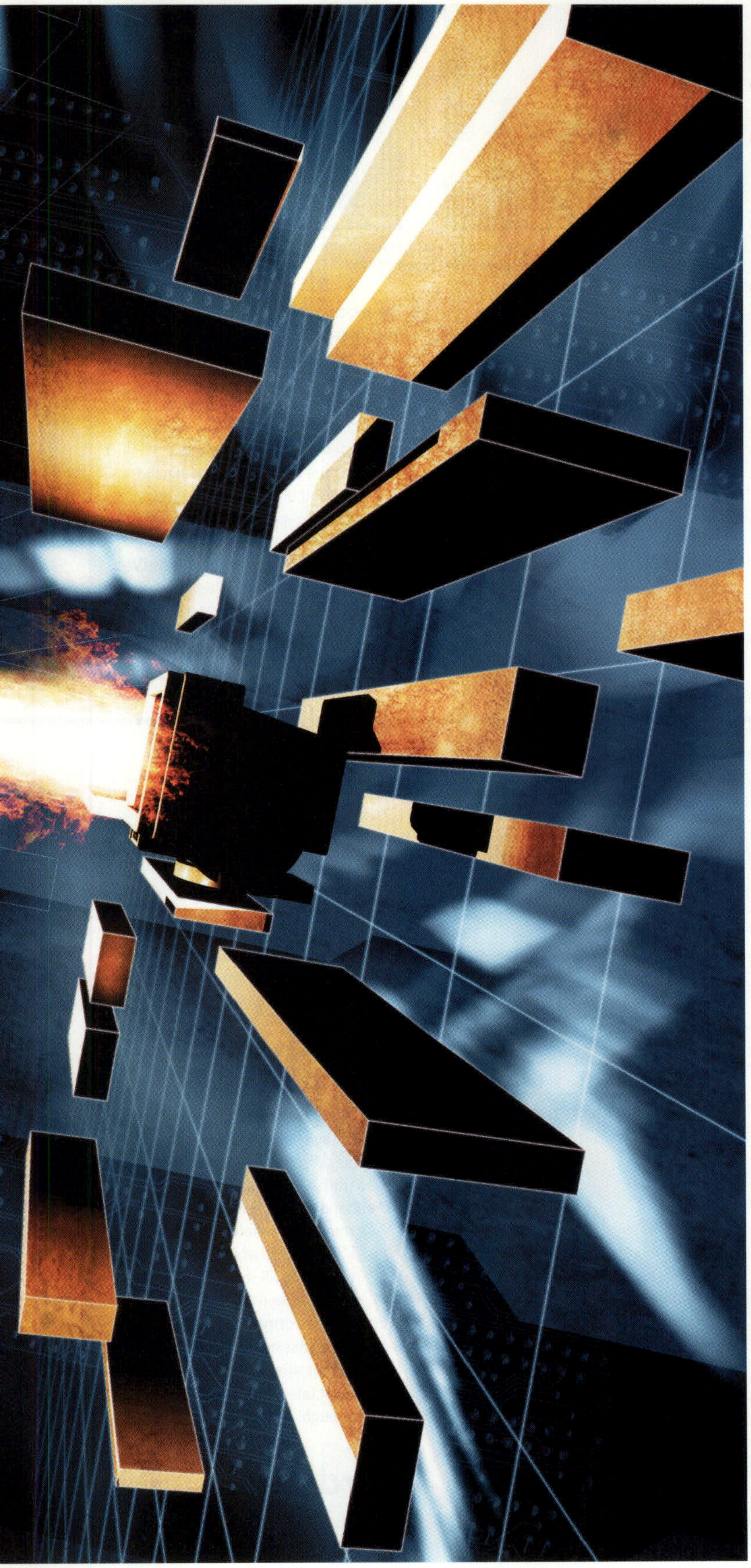


Illustration: Magic Torch **[t]** 01273 202147 **[w]** www.magictorch.com

The perfect 3D computer

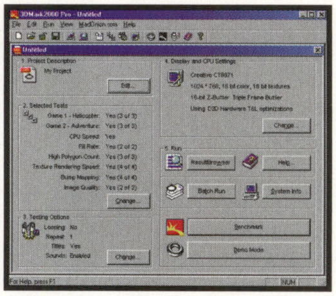
So by now you should have your 3D software sorted, but what about the hardware side of things?

A graphics controller is an essential part of your computer because it generates the image that you see. Whether your computer's graphics chip is integrated into the motherboard or is part of a standalone graphics card, its performance will have a dramatic impact on the speed at which you can work, and, to a certain extent, the quality of the work that you can do.

The graphics controller has a single job: to output an image on to a two-dimensional screen. The screen image is built up in dedicated graphics memory before being displayed, enabling the graphics controller to display the image in one go, rather than a bit at a time. The higher the screen resolution and the more colours in the image, the more memory required to display it. Also, the faster the processor needs to be in order to maintain an acceptable, flicker-free refresh rate (the speed at which the screen is redrawn).

Increasingly nowadays, most graphics cards incorporate 3D functionality as well – in fact, it's become the major selling point for most of them. In order to choose the right 3D graphics card, you need to understand something about the technology.

There are two components in creating a 3D scene: rendering (drawing) the working image, and rendering the final production frames. The latter process is still dependent



1. Project Description
My Project

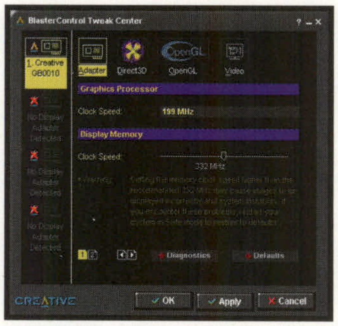
2. Selected Tests
Game 1 - Helicopter: Yes (3 of 3)
Game 2 - Adventure: Yes (3 of 3)
CPU Speed: Yes
Fill Rate: Yes (2 of 2)
High Polygon Count: Yes (3 of 3)
Texture Rendering Speed: Yes (4 of 4)
Bump Mapping: Yes (4 of 4)
Image Quality: Yes (2 of 2)

3. Testing Options
Looping: No
Repeat: 1
Titles: Yes
Sounds: Enabled

4. Display and CPU Settings
Creative CT6971
1024 * 768, 16 bit color, 16 bit textures
16-bit Z-Buffer Triple Frame Buffer
Using D3D Hardware T&L optimizations

5. Run

3D Mark is one of the most comprehensive benchmarking programs for *Direct3D*.



Graphics Processor
Clock Speed: 199 MHz

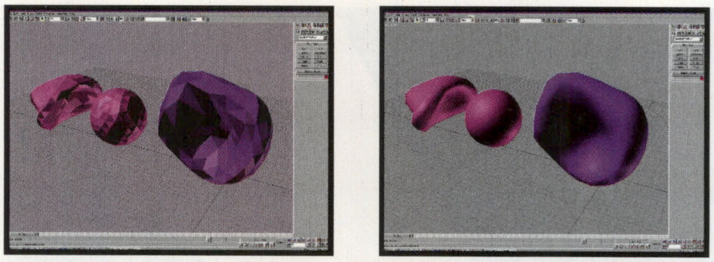
Display Memory
Clock Speed: 332 MHz

Often it'll be necessary to tweak beyond the instructions in the manual to get the best from your 3D accelerator.

upon your computer's processor. The maths involved is incredibly complex and 3D accelerators can do little to help. The only real solution is to throw more processing power at the task.

The Mac G4's architecture fully supports multiprocessing and the recent line up of PowerMac G4s include dual processors. Dual processor PC motherboards have been around for years, but there are times when even dual processing is insufficient. This is when computers must be linked together into 'render farms' so that their combined processing might can be used to render scenes in an acceptable time-frame.

However, creating a 3D object is not just about the amount of time taken to render the final frames. You'll spend far more time in front of your monitor looking at your incomplete scenes in a 3D package. While you're working on a 3D scene, your computer still needs to be able to represent that scene in a manner that enables you to have some idea how the finished image will look. To do that, it produces a user-definable lower quality version that sacrifices the ultimate realism of a full raytrace, but which requires substantially less processing power. Even so, these low quality preview images still require a lot of processor power to create.



Your choice of 3D API will make a big difference to the quality of your in-progress display. See how much worse *Direct3D* looks than *OpenGL* in *3D Studio MAX*.

For a while, new CPUs have incorporated 3D enhancements that accelerate the operations required to create a 3D image. On the PC, AMD was the first company to incorporate 3D acceleration directly into a CPU, and its 3DNow! instruction set provides a significant 3D boost to games, while Intel's Pentium II and III chips incorporate MMX and SIMD technology which performs multiple operations in a single operation, thus enhancing all forms of 3D calculations.

The processor used inside the Macintosh G4 is the Motorola AltiVec engine, dubbed the 'velocity engine'. The super-scalar processor can dispatch and complete two instructions simultaneously and is built around several processing units including the branch processing and floating-point unit.

The floating-point unit can deal with 32 and 64-bit data types, but it's the vector-based processing of the AltiVec instruction set that provides the efficient calculation on vector integer and floating point instructions. These operations are heavily used in all aspects of 3D work from modelling to

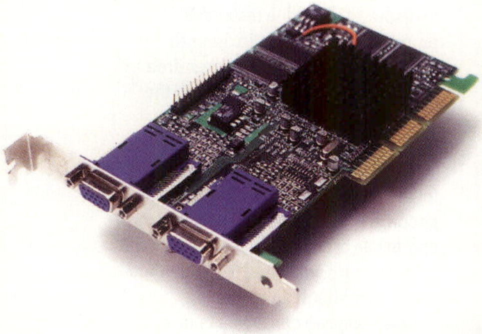
Matrox Millennium G450

Price
£128.08

Company
Matrox

Telephone
01753 665544

Web
www.matrox.com/mga



As the cheapest card in our round up, it won't come as a surprise to learn that the G450 is also one of the least powerful 3D accelerators. In a sense though, it's not about pure 3D power because it has other attributes. Its main benefit is the fact that it has two monitor outputs, one of which can be configured to output to a TV instead. Its *OpenGL* performance was in the lower half of the table, but not nearly as low as we'd expected. Unlike many dual-head cards, it accelerates both outputs. There are loads of ways that you can output to each head, but the most useful is probably to display two entirely separate images, thus doubling your working area. We imagine running a 3D program on one screen and a 2D texture generator for instance, on the other. While this card sorely lacks the 3D clout of some others, it offers very real benefits to multi-application users at an excellent price.

Verdict
★★★⯪☆

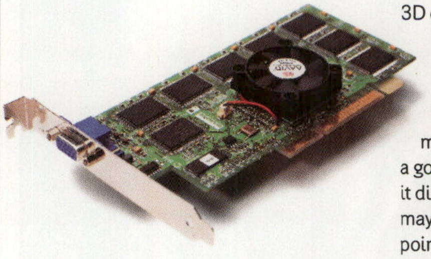
Diamond S3 Fire GL-1

Price
£695

Company
Diamond Multimedia

Telephone
01189 444400

Web
www.diamondmm.co.uk



This card is strictly aimed at the graphics professional, with no Windows 98 support, although it does support NT and Windows 2000. While it provided good performance a year ago, the competition has overhauled it, pushing it down into fourth place in the speed stakes. However, you can install up to four FireGL cards in a single PC. It also has full support for multi-threaded *OpenGL*, so multiprocessor users can get the very best rendering performance. It also comes with optimised Pentium III drivers, enabling you to utilise the processor's integrated 3D enhancements. The FireGL-1 offers a maximum resolution of 1,920x1,200, which is more than enough to fill the biggest single-screen monitor. It's a modest performer, but its price looks a good deal less competitive now than it did when it was new. Power users may appreciate some of its subtler points though.

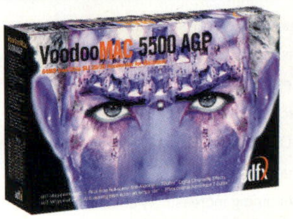
Verdict
★★⯪☆☆

3D cards for the Mac

ATI Nexus 128
Company: ATI Technologies
Tel: 01628 538115
Web: www.atitech.com

This card is the bigger brother of the 16MB ATI card installed with the G4 range. The 128-bit RAGE graphics processor combined with 32MB RAM support 1,920x1,200 pixels at 76Hz refresh. The Nexus supports and accelerates *QuickTime*, *QuickDraw 3D* and *OpenGL*. Compared to the graphics card in the G4 the Nexus is only slightly faster at 3D graphics and support just slightly higher resolutions.

3dfx Voodoo 5 5500
Company: 3dfx Europe
Tel: 01753 502800
Web: www.3dfx.com



Based around the new Voodoo 5 chipset and utilising two VSA-100 graphics processors running at 166MHz, the 5500 boasts 64MB on-board RAM. Support for anti-aliased polygon edges produces very smooth 3D animation. 32-bit colour and support for resolutions up to 2,048x1,536 at 85Hz plus *QuickTime* acceleration make this a good buy and the first time that 3dfx has attempted to break into the professional market.

rendering. The AltiVec instruction set dramatically increases the productivity of the chip compared to the earlier G3 PowerPC processor when faced with these kinds of demands from a 3D application.

3D accelerators

Even that is just a drop in the ocean compared to the power needs of real-time or near real-time 3D manipulation. The solution is a dedicated processor whose sole task is the manipulation of 3D scenes and objects.

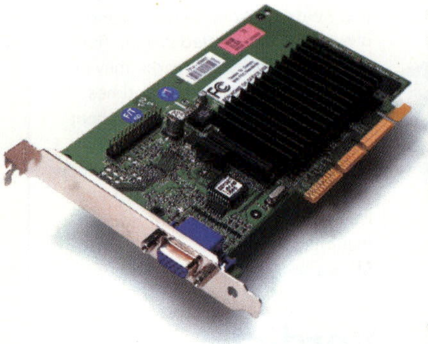
Although graphics workstations had already been creeping in that direction, ironically, it was the games market that really powered the current surge in affordable 3D accelerators. The first generation of 3D accelerators were standalone cards that worked alongside your existing graphics card, but now virtually every accelerator is integrated with a graphics card.

The most basic criteria for a 3D accelerator is the number of polygons (triangles) that it can draw in a second. However, that's almost like asking an artist how quickly he can draw a landscape. What about quality? What about colour? What about detail or lighting? What media will the artist use? Exactly the same questions may be asked of a 3D accelerator.

There are many enhancements that can be applied to a 3D image to improve the quality. While it's good that a 3D accelerator can draw quickly, the ability to apply these enhancements can make all the difference in terms of quality or how smoothly the objects can be manipulated. Another important factor is the APIs that are supported by

ELSA Gladiac GeForce MX

Price	£139.99
Company	ELSA
Telephone	08000 563445
Web	www.elsa.co.uk

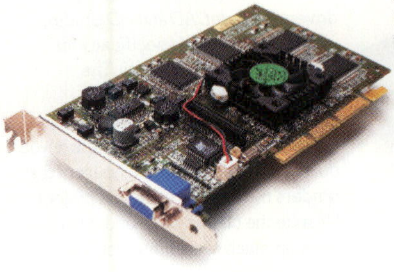


The NVidia chipset has dominated the 3D games scene over the last year, yet NVidia-based cards such as this one also offer excellent benefits to more serious users too. This is ELSA's new entry-level GeForce card, and it's £50 cheaper than its current flagship product, the GTS2. The performance difference is way out of proportion to the price difference, and even ELSA admits that they've made this card too good… Under *OpenGL*, the MX scored better than any other card in our tests using the Viewperf benchmarking software. However, its *Lightwave* animation speed was about 17 per cent slower than the GTS2, perhaps reflecting its slower memory type. It supports a number of advanced 3D technologies such as a transform and lighting engine for performing geometry manipulations. Gamers may love it, but the truth is, graphics users will also discover that this is an affordable card with a kick like a mule.

Verdict
★★★★½

ELSA Gladiac GeForce2 GTS

Price	£249.99
Company	ELSA
Telephone	08000 563445
Web	www.elsa.co.uk



As the current pinnacle of the NVidia GeForce family, this superb card offers great performance to all computer users. Its maximum 2D resolution is a hefty 2,048x1,536 and it supports refresh rates way beyond the capabilities of even the most expensive monitors. A double data rate RAM coupled with a state of the art 3D accelerator enables the Gladiac to provide 3D performance that leaves many a pro card behind. Like the MX, speed isn't the only benefit – the GeForce has a lot of the functions that graphics users seek. A T&L engine, per pixel lighting, quad texture pipelines, full-scene anti-aliasing and up to eight lights in hardware make this a real big-bang-per-buck accelerator.

Unfortunately, its power requirements mean that like the MX, it won't work with every motherboard. It supports *OpenGL*, *Direct 3D* and comes with Windows NT and 98 drivers. A great all-rounder.

Verdict
★★★★☆

Making your card sing

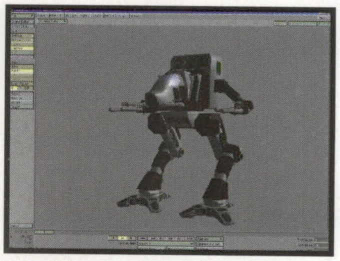
As graphics card performance increases, you can no longer be sure of getting the best performance straight out of the box. In fact, with some of the GeForce, E&S and 3D/FX cards, some AGP motherboards may not even be powerful enough. It's becoming increasingly common for 3D cards to require extra power, which can be drawn via cable extensions, or by drawing every last amp from fully-specified motherboards. It may surprise you to learn that not all motherboards – even some of those from manufacturers like Gigabyte – fully adhere to the AGP specifications. It's essential that you download and use the latest drivers for your motherboard if you want to get the maximum performance from your 3D card. In fact, you may not be able to activate AGP 4x mode without them. For real power-hounds, it's even possible to overclock the AGP port on some motherboards. Although not a practice that CA recommends, it can yield 20 per cent more performance.

a 3D accelerator. Your software uses a kind of software universal translator known as an API to communicate with your 3D accelerator.

Microsoft's *Direct3D* API is a part of the *DirectX* suite supplied with Windows and it's favoured by the games-authoring community. Professional PC users tend to use Windows NT, which is more stable, but does not have *Direct3D*. Instead, they use *OpenGL* (which is also available on Windows 95/98). *OpenGL* is the preferred choice of hardcore gamers too, and it offers greater functionality, but is considered much harder to program for. Mac users have *QuickDraw 3D*, which was introduced around 1995 to offer improved display and acceleration of serious 3D applications. *QuickDraw 3D* was integrated into the *QuickTime* technology suite as a graphics library to enable you to create, configure and render three-dimensional objects. Like *Direct3D*, *QuickDraw 3D* also supports the ability to texture and colour a model. It's an extensible API enabling you to extend its functionality, although functions such as real-time texture mapping are not natively supported. *QuickDraw 3D* is still extensively used in 3D and modelling applications although many developers are now opting for universal cross-platform APIs such as *OpenGL*.

OpenGL, *QuickDraw3D* and *Direct 3D* consist of a huge number of 3D commands, of which programmers may use a subset. They may also add on custom commands to support hardware features specific to a particular 3D accelerator. If a program uses *OpenGL*, but your graphics card does not support all the features used in the program, *OpenGL* is smart enough to use the available functionality.

There are also hardware or application specific APIs such as *Glide* and *Heidi*. These may produce additional performance or other benefits in a particular application environment, but aren't suitable as generic APIs.



Ultimately, the best test of a new 3D accelerator is how much more useable your 3D applications are when you use it, and how much better they look.

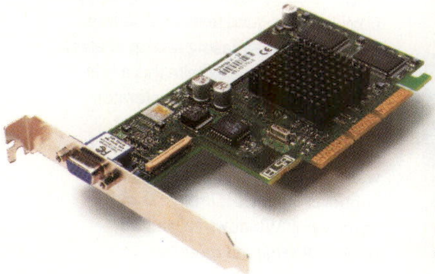
In order for your graphics card to be accessible using an API such as *OpenGL*, it requires a software driver. This driver describes your graphics card's capabilities to your computer and enables your 3D API to communicate with it.

Drivers are an essential part of the equation, and they're regularly being updated. A good driver can yield significantly greater performance from

ELSA Synergy II

Price	£199.99
Company	ELSA
Telephone	08000 563445
Web	www.elsa.co.uk

Sometimes all is not as straightforward as it may appear. On paper, the Synergy II provides distinctly lacklustre performance, which could lead you to conclude that it was a no-hoper, but according to ELSA, it has a number of positive features that outweigh its relative slowness. Based upon the Riva TNT2 chipset, the board claims to be one of the most stable on the market. If it were true, this could mean savings in terms of time gained not rebooting. Unfortunately, it was one of just two cards that crashed during our testing process. With custom drivers for *AutoCAD* and *3D Studio*, this may be a card specifically for users of those products. The optimised drivers display environmental features such as mist and fog. Seeing these before you do a final render, can save hours of test renders over the duration of a project. Despite the claims, we found it hard to work up much real enthusiasm.



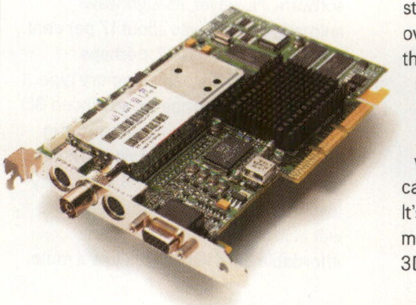
Verdict

★★☆☆☆

ATI All-in-Wonder Pro 128

Price	£159
Company	ATI
Telephone	01628 480200
Web	www.ati.com

It's incredible just how quickly 3D technology has advanced and this card is a perfect example. No so long ago, its Rage Fury chipset was a contender, but now it scores a dismal last place in two of our three benchmarks. Having said that, it's not all that expensive and it sure incorporates a lot of additional multimedia functionality. At least it works under NT and Windows 98, which is more than can be said for the Voodoo 5500 or the Fire GL-1, and lowly though its performance may be, it still yields a noticeable improvement over a non-accelerated system. That's the trouble with benchmarks: they're not a measure of how many times better a system is than one without acceleration. The All-in-Wonder is a versatile multimedia card, with video capture, TV in and out and a TV tuner. It's a good starting place for a novice multimedia producer, in which case, its 3D is a small bonus.



Verdict

★★⯪☆☆

Viewperf tests *OpenGL* performance. However, performance can vary according to the operating system being used.

a piece of hardware than a mediocre one, so it's important that you check from time to time to ensure that you're using the latest ones for your hardware.

As you can see, there are many elements in choosing the perfect graphics system, and what suits one person may not suit another. Decide what's important to you and what your budget is, then see which one best fits your needs. A new graphics card is likely to be your first step, so here are eight to get you started. ca•s

Comparative features

Model	Matrox G450	Diamond Fire GL1	ELSA Gladiac GeForce MX	ELSA Gladiac GeForce2 GTS	ELSA Synergy II	ATI All in Wonder Pro 128	3Dlabs VX1	3D\FX Voodoo 5500
OS support	Win 95/98, Win NT 4, Win 2000, OS/2 Warp, Linux	Win NT 4, Win 2000	Win 95/98, Win NT 4, Win 2000	Win 95/98, Win NT 4, Win 2000, Linux	Win 95b/98, Win NT 4, Win 2000	Win 95/98 (all features), Win NT 4 (graphics only)	Win 98, Win NT	Win 95/98
Driver support	OpenGL, Direct3D	OpenGL	OpenGL, Direct 3D	OpenGL, Direct3D	OpenGL, Direct3D	OpenGL, Direct3D	OpenGL, Direct 3D	Direct 3D
Onboard RAM	32MB DDR RAM	32MB SG RAM	32MB SD RAM	32MB DDR RAM	32MB	32MB	32MB SDRAM	64MB SD RAM
Max resolution 2D	2048x1536	1920x1200	2048x1536	2048x1536	1900x1200	1920x1440	2048x1536	2048x1536
Refresh rate 1280x1024 24/32-bit	120Hz	85Hz	120Hz	120Hz	170Hz	130Hz	120Hz	120Hz
Interface	AGP 2x/4x	AGP 2x	AGP 2x/4x	AGP 2x/4x	AGP 2x/4x	AGP 2x/4x	AGP	AGP 1x/2x
Viewperf rating in Windows NT	9.83	14.45	64.60	52.88	10.34	7.08	12.61	7.72 (under 98)
OpenGL 3D Animation in Windows NT	Failed to run application	8 secs	7 secs	6 secs	12 secs	13 secs	10 secs	23 secs (under 98)
3D mark rating	1,504	No Windows 98 support	3,142	3,352	1,417	1,334	1,206	1,458
Extras	Dual monitor output, TV out	None	None	Revelator 3D glasses compatible	Many certified drivers	TV tuner, TV in/out, video capture, etc	Many certified drivers	None
Score	3.5	2.5	4.5	4	2	2.5	2.5	3

3D Labs Oxygen VX1

Price

£229.13

Company

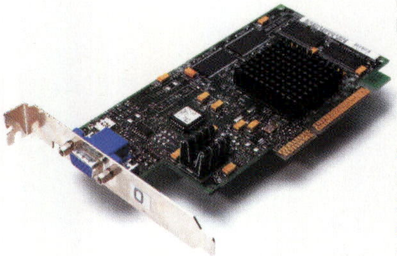
3D Labs

Telephone

01784 47055

Web

www.3dlabs.com



3D Labs is one of the big players when it comes to 3D workstation cards, and in the VX1, 3D Labs is attempting to distil some of its technology into a product that the home user can afford. Among the VX1's key features is its rock-solid support for Windows NT and 98, as well as its full implementation of *Direct 3D* and multi-threaded *OpenGL*. The latter provides multiprocessor support. It also supports Intel's SIMD and AMD's 3DNow! processor enhancements, which can yield in excess of 10 per cent more speed. The card is capable of handling texture maps up to 2,048x2,048 in size, while its transparent and efficient use of virtual memory for textures, means that your models will move more smoothly. Our real-world tests revealed its power to be mediocre, but if stability, image quality and smoothness are important, then the VX1 is still be worth considering.

Verdict

★★½☆☆

3D/FX Voodoo 5500

Price

£249

Company

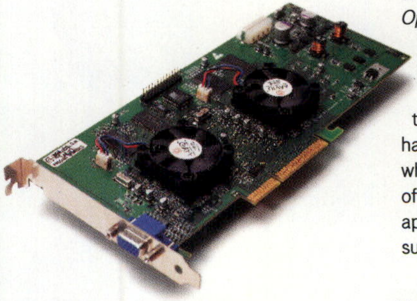
3D/FX

Telephone

01753 502800

Web

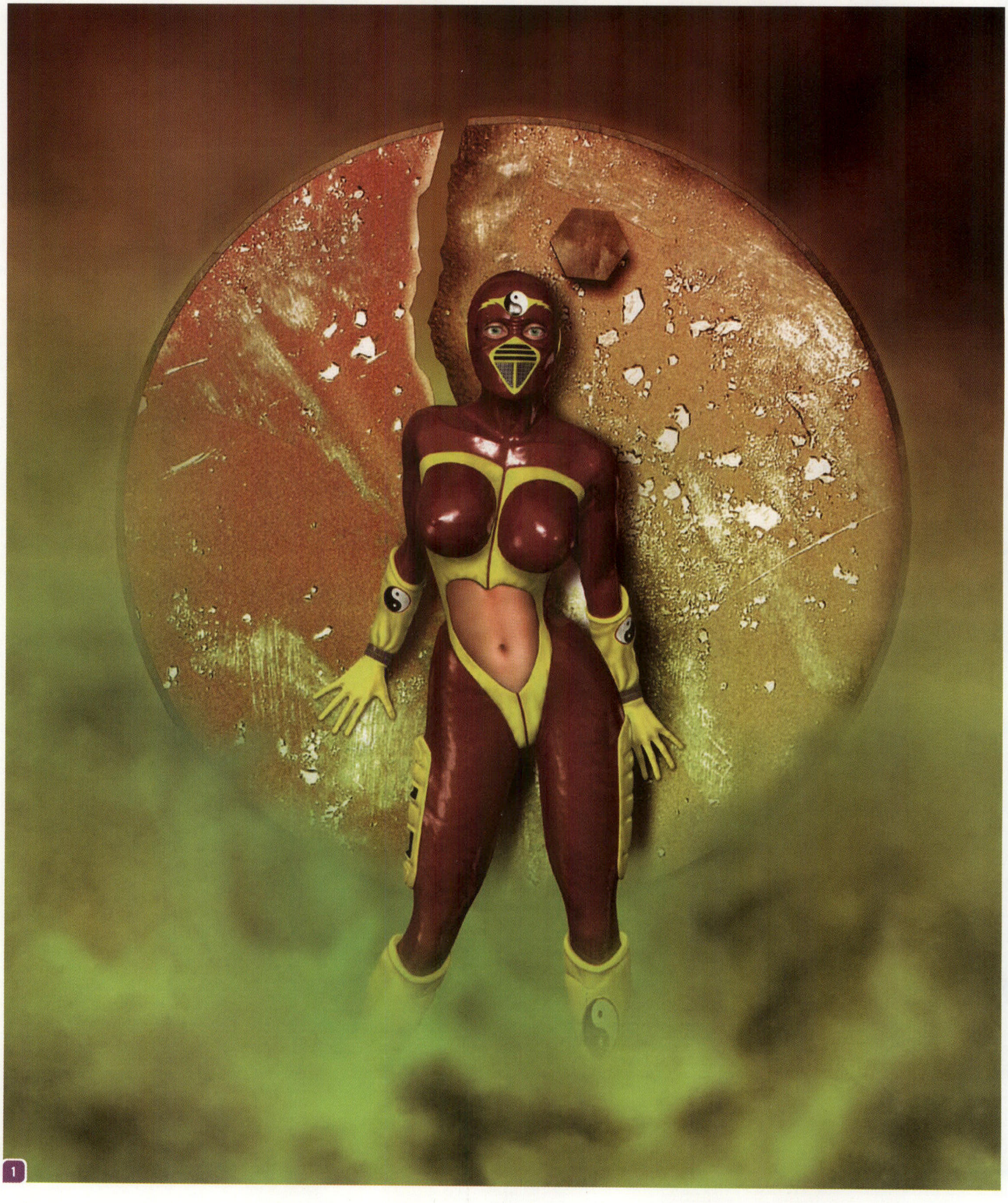
www.europe.3dfx.com



Of all the cards in this group test, this is undeniably the least well-oriented towards serious graphics work. That's hardly surprising as it's a dedicated gamer's card and a superb one at that – but we've included it here for the sake of completeness. The Voodoo 5500 does not work under Windows NT, and even under Windows 98, its *OpenGL* performance was dismal. This is quite surprising because it provides great *Direct 3D* performance. The discrepancy perhaps reflects the lack of optimisation in its *OpenGL* drivers, or it may be indicative of more sluggish *OpenGL* performance under Windows 98 generally. Relatively few serious applications provide good *Direct 3D* support, so the benefits that this card will provide are minimal. It has lots of technological features, of which its full scene anti-aliasing is one of the highlights, but they just don't apply to anything but games. It's a superb card – but only for games.

Verdict

★★★☆☆



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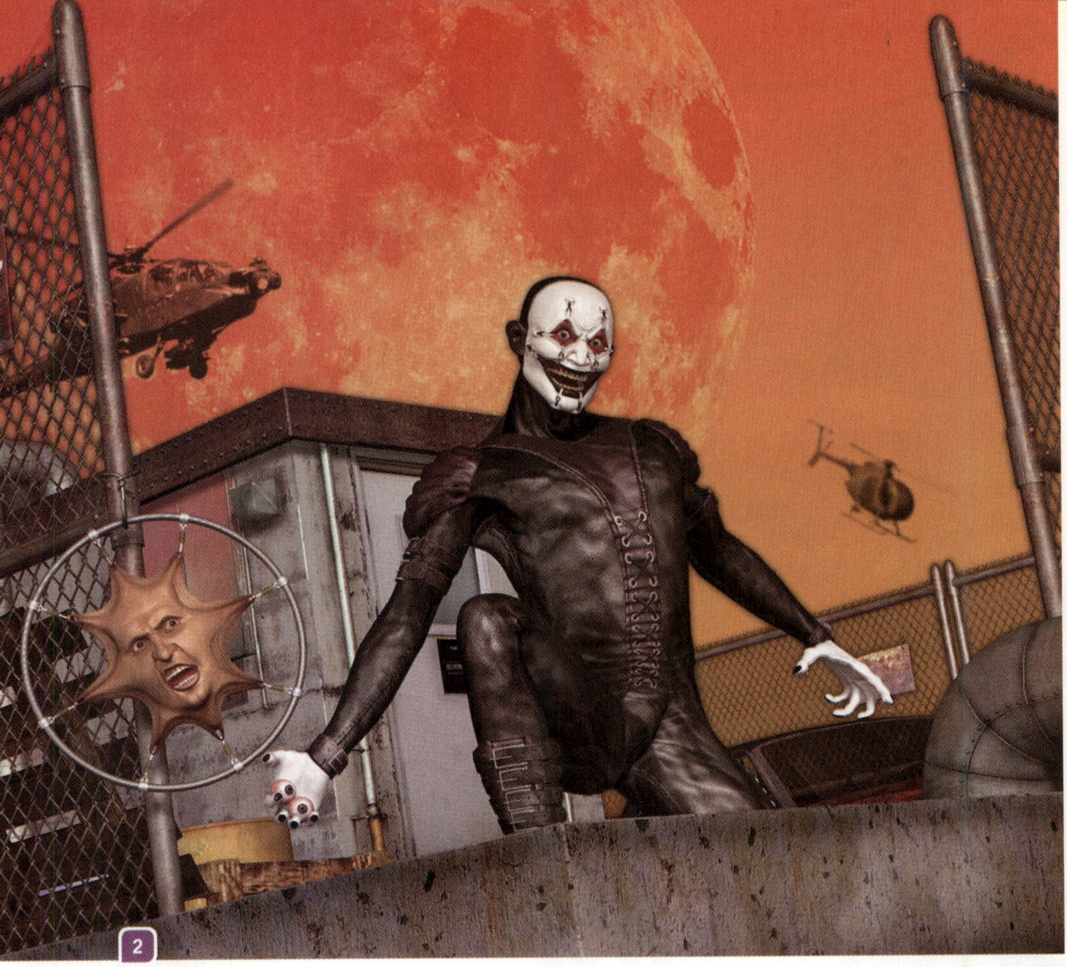
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Komodo Studio

Bill Fleming is the mastermind behind Komodo Studio, a Californian design company creating 3D characters with a difference. ***"It's definitely unusual, " he says, "I believe in a creative work environment where artists can be artists."***

1. Bill Fleming, head of Komodo Studio, creates a detailed Bio for the characters he designs, but what this lady gets up to in her spare time is anybody's guess.
2. This image of Nahualli is taken from the cover of *P-XG 1*, a horror-fantasy comic book comprised entirely of Bill's 3D rendered art. Along with science fiction illustration, Bill considers the genre to be the most brutal of all in terms of texturing, detail and complex model-making demands.
3. Bill's trademark talent for character creation shines through in this portrait of a warmongering gerbil G.I.
4. These wide-eyed yuletide characters feature in *Buster's Christmas Wish*, one of Komodo's full-length animated TV projects.

A legend in his own render time, Bill Fleming is virtually synonymous with 3D. Since starting in the field a few years ago, he has written a series of inspirational books on topics including creature creation and photo-realism, and high-profile industry magazines are liberally sprinkled with his images, tutorials and articles.

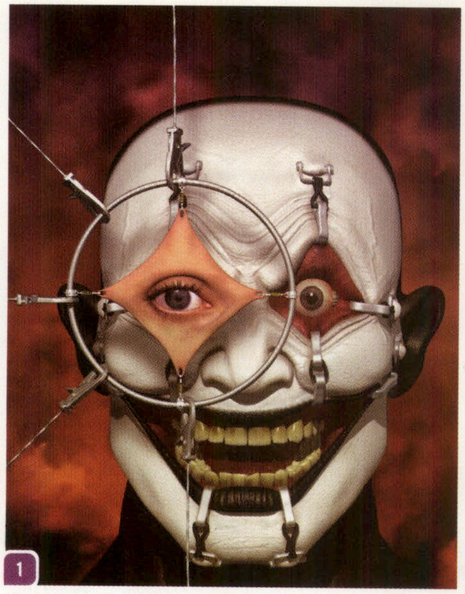
Despite a prodigious workload and an almost nocturnal lifestyle as the head of Komodo Studio, he also somehow manages to fit in regular contributions to *3D World* and *Computer Arts* – in fact, this very magazine has a feature explaining rendering written by the man himself.

Rather than jealously guarding his trade secrets, however, Bill is committed to passing on the benefits of his knowledge to raise the standards of the industry: "In our industry, technology is light years ahead while education is still in the dark ages," he says. "When the two are on the same playing field we'll start to see significant global improvements in 3D production."

One of the recurring themes of Bill's tutorials and articles is the importance of translating personal experience and observation into 3D projects. Time spent as a naval engineer has enabled Bill to dream up complex designs for goblin inventions in a forthcoming Komodo adventure film production. His experience as a psychologist also helps him to invest his characters with an extra dimension of idiosyncracies.

For example, *Creepy Candy Caper*, one of several animated films currently under production, features a totally bald werewolf whose inadequacies have made him an outcast in the horror community. "One of my greatest complaints about Hollywood is that many of the creatures they design would literally fall over from poor design," says Bill. "If you want the viewer to believe in the character, it has to be well designed. Viewers may not be experts in creature biology, but they're not stupid, either."

These principles inform the Komodo philosophy as a whole, and since establishing 3D as the studio's sole



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1. ***Eye of the Beholder*** shows the tireless attention to detail that permeates the studio's work, as well as returning to the recurring theme of fantasy imagery.
2. Bill's take on Warhol's Campbells' soup picture? More likely an exercise in diffusion, the attribute that Bill considers must be mastered to achieve photo-realism.
3. Nahualli in an explosive situation, demonstrating the importance of combining chaos and order in the composition of a scene.
4. Bill is a great believer in studying the principles of traditional art, such as colour theory and anatomy, to inform 3D illustration, as this dramatic image implies.
5. This desert scene is taken from *Goblins*, an epic 3D feature film adventure in production at Komodo Studio. Bill's initial inspiration for the *Goblins* design came from Brian Fraud, the illustrator who worked with Jim Henson on *Dark Crystal* and *Labyrinth*.
6. A still from Komodo's *Creepy Candy Caper* film, a ghoulish animation that features a procession of creeps and monsters from the ghost of horror films past.

Sample animation files of Komodo Studio's work are on the CD in the root directory.

Chaos theory

Bill Fleming, 3D guru and head of Komodo Studio, describes himself as a '3D chaotician'. The title was adopted when he first began working on photo-realistic techniques: "The real world is wrought with chaos and I spend my time making order of this chaos, meaning I examine the chaos in reality and turn it into a formula for making photo-realistic 3D images," Bill explains. "Things that are too neat aren't realistic. Organization in nature is a fantasy," he adds. Bill's fascination with mathematics, and his attempts to calculate order within chaotic systems are a major facet of his art. For Bill, lack of chaos is the one thing that undermines most attempts at photo-realism.

priority, Bill has assembled a team of five artists whose multi-skilled expertise provides a mutually inspirational working environment. "I believe in talent, not volume," Bill says. "These five guys are 3D commandos, capable of doing the work of a 25 person team."

The smaller scale of the operation has numerous advantages for Komodo. For a start, it eliminates what Bill describes as the schizophrenia inherent in the animation of Disney and Pixar, where the quality of modelling, texturing and animation fluctuates wildly (to the trained eye) during a feature film because it has passed through the hands of so many artists.

Vested interest

At Komodo, an animator has control over the entire creation of a character, from modelling to final animation. In this way, the artist's role becomes akin to that of a craftsman or puppet master, entering into the psyche of the character. This approach also ensures that the artists' creativity remain fresh all the way to the final production. While the animators don't share the characters, they do share the profits, so the production team has a vested interest in the quality of the final product.

Simultaneously producing several feature films, each of which is often up to an hour long, calls for a high level of efficiency in Komodo Studio's working methods. All members are able to model, texture, light and animate to a professional standard, and each typically has two Quad PIII 750MHz PCs with between 1 and 2GB of RAM at their disposal, so that no time is lost waiting for tests to finish.

Despite this formidable hardware arsenal allied with a 100-processor strong renderfarm, each frame of animation can take up to 30 hours to render, and with 150,000 frames of animation in an average production, the choice of software is crucial. Depending on the effect the studio is seeking, a number of animation programmes are used: *Lightwave*, *Maya*, *Cinema 4D* and *Mirai* all have very specific strengths and

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6

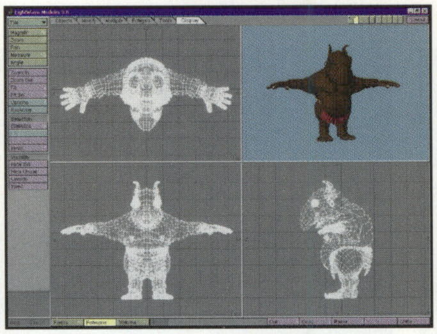
weaknesses, and the studio often uses a number of tools to develop a project.

Bill's own tireless attention to detail, and Komodo's unique brand of photo-surrealism, have earned plenty of plaudits, but admiration in 3D is a hard-won commodity. Bill's advice to newcomers to the industry is every bit as realistic as his art, emphasising the need for patience above all.

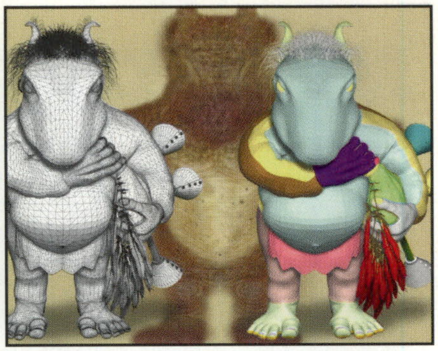
"The world of 3D graphics is vast and there's much to learn before you can simply whip out awesome stuff on a daily basis," he warns. "Each segment of 3D is vastly complex and if you just lightly gloss over it, you'll never accomplish anything significant," he says. Researching the formative elements too, including motion, physics, colour theory, photography and stage lighting are a must. As daunting a prospect as this is, with artists like Bill showing the way, the mission seems much more possible.

Komodo Studio was formed in 1994 and is based in California. Find them at **[w]** www.komodostudio.com

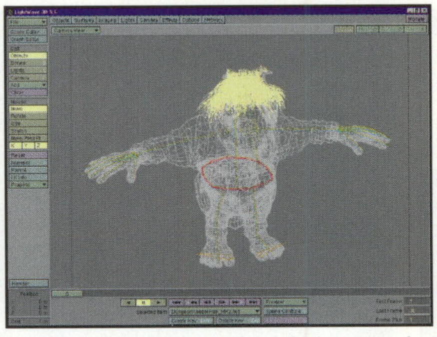
Creating a 3D creature



1 The model is created using polygons to enable very detailed editing of the mesh. The model begins as a flat mesh representation of individual parts such as the body, head, hands and feet, which are then extruded and details are added by dividing and extruding polygons. The parts are flat modelled from the perspective of the greatest volume, meaning the body from the front, the head from the side and the hands/feet from the top.



2 The model is created in low resolution, then subdivided to a higher resolution for texturing. Since the model is a complex, organic shape, different surfaces/materials are defined for projection mapped textures. Nearly all the defined surfaces are selected for planar mapping to make texture creation easier. For organization, each surface is given a different colour.

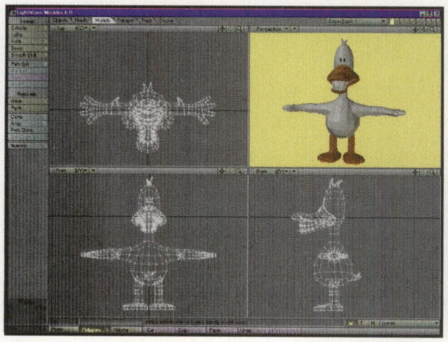


3 Once the model is textured, a skeletal structure of deformation bones is added to pose and animate the mesh. The bones are assigned ranges of influence and in some cases, the actual points they effect on the mesh for precise deformation. The belly is a ponderous feature, so we'll add a ring of bones to manipulate the movement. A cross bone is added to the toes to help them bend during walk cycles.

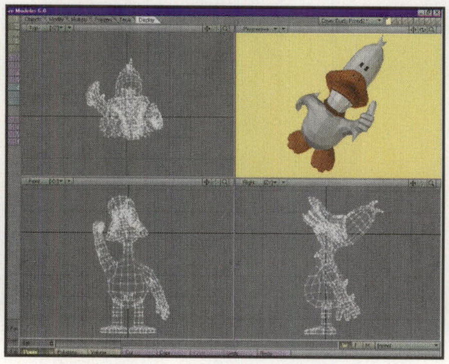
4 The model is posed by rotating and moving bones. The belly bones are scaled outward to expand the belly for the pose. A Grilch Pipe prop is added and parented to the creature object so that it moves with the character. Feathers are added individually so they can be rotated to simulate movement in the breeze.

Duck cover

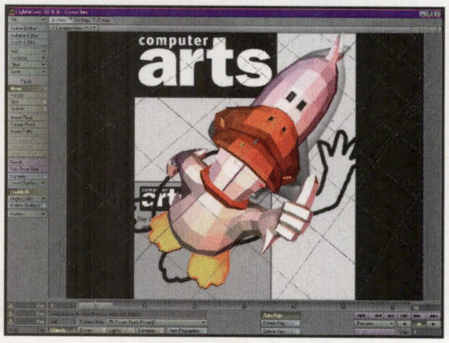
Have a quack at recreating our cover image...



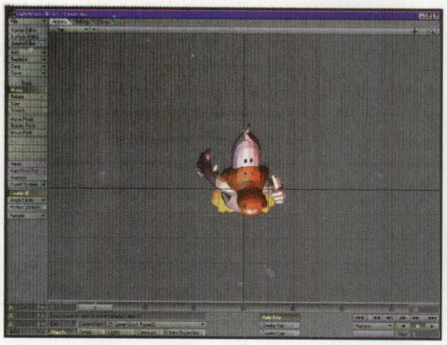
1 A low resolution duck model was created using polygons. The duck was one model and the bill another, making it easier to pose the mouth. The low resolution version of the model was used for the posing. Once a final pose was selected, the model was subdivided twice to create the very smooth, final version used for the cover render.



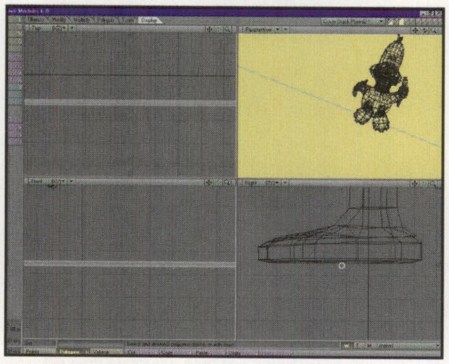
2 While it's assumed that bones would be used to pose a 3D character, another way is to manually pose the duck by selecting polygons and rotating them. Since this was a fairly simple model in a static one-time pose, there was no point in wasting a lot of time setting up bones. Manual posing was infinitely faster.



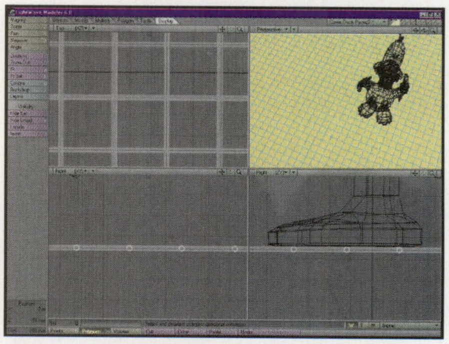
3 A template for the layout of the cover image was loaded in the background so the actual 3D duck could be posed properly. A low resolution model was used so corrections could be made easily. For example, the head needed to be rotated slightly to look at the camera and the right hand was rotated outward to appear more natural from this angle.



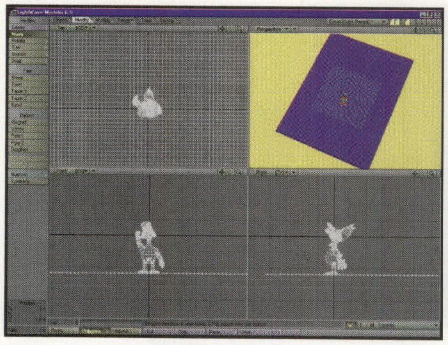
4 The main light, focused looking down at the face to remove overt shadows, is a Spot light with Soft Shadows and 100 per cent intensity. There are four accent point lights around the duck, each with an intensity of 30 per cent and all have Specularity and Shadows disabled. The lights are red, blue, yellow and orange to add subtle color contrast.



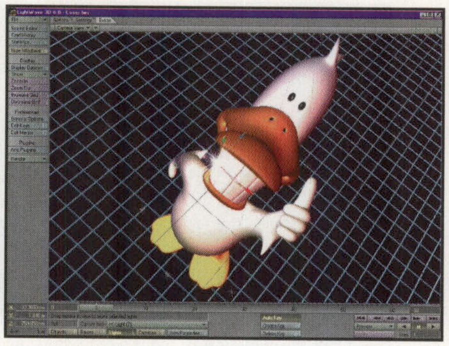
5 A 3D grid was created under the duck by first creating a single 24 side cylinder using the duck foot as a template. The grid needed to be small enough so it didn't overpower the duck, but large enough to convincingly hold his body weight.



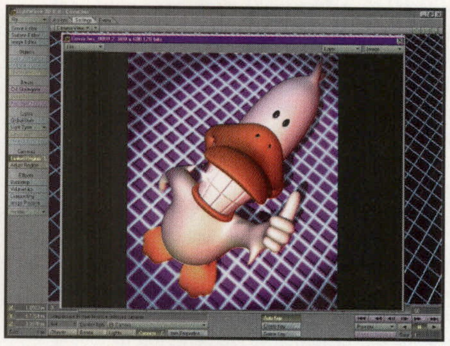
6 The single cylinder was cloned 49 times along the Z-axis, with slight offset to put a gap between the clones. These 50 cylinders were then grouped, cloned, and rotated 90 degrees clockwise to form a 3D grid. The grid was given a cyan colour with a Luminosity of 25 per cent and a soft glow to appear like neon tubes.



7 A ground box was placed under the grid. There was a gap between the ground box and the grid so shadows would be cast on it. The ground box was also rotated 15 degrees downward so there was a variance in the shadows created by the grid. The shadow chaos helped to remove the monotony of the grid. It also created more depth.



8 In the final layout, a small Lens Flare was added on the teeth to add more character. It gave the duck a pure appearance, in contrast with his sinister toothy smile. The Lens Flare was set to render eight streaks and set to Fade with Distance so the flare effect wasn't too intense. The idea was to create just a small glint, not a supernova.



9 The low-resolution duck model was replaced with a high-resolution, subdivided model for the final render. The duck cover was rendered at a resolution of 5000x3750 pixels, with a Medium quality Antialiasing. A Limited Region was created using the original template image so it would render at the cover proportions.

Win [Cinema 4D XL 6.1]

Get your hands on this top-quality 3D package worth £1395 from Hisoft

This month *Computer Arts Specials* has got together with Hisoft to give you a chance of winning the latest version of *Cinema 4D XL*. This latest update of *Cinema 4D XL* has been heavily re-written and is packed with powerful new features, tools, and a brilliant new interface.

Workflow has been seriously improved and, as a result, the program is a real joy to use. The interface is customisable, so you can push your creativity to the limits with the environment of your design. It's also possible to quickly switch between a modelling interface and an animation interface.

Features include expressions, motion sequencing, non-linear modelling system, new lights redesigned timeline, fast rendering, metasplines/particles and 3D sound rendering.

A new hierarchical menu makes it easier to find and apply textures and shaders. You can also copy and paste textures and shaders from one channel to another. A new SDK and plug-in architecture gives developers of add-on products access to improved interface tools, low level system calls and much speedier performance.

Cinema 4D's exclusive C.O.F.F.E.E. language provides you with tight integration into the environment as well as total cross-platform compatibility.

You'll find that you can now start porting your old plug-ins to the new version 6 or create new shaders, plug-ins, scripts,modules and expressions.

Also new is the new multi-target kinematics functionality, which enables you to use as many control targets as you want within one IK hierarchy.

This gives you much more control and also eliminates unpredictable effects using IK chains. Imagine a leg with targets for the toes, the ankles and the knee.

Cinema 4D now supports variable 'schemes' which work in a similar way to the 'skins' of other programs, and enable you to change the look of your GUI (graphical user interface).

To win a copy of this stonking piece of software, just answer the following question and Cinema 4D XL 6.1 could be yours!

You can find out more by visiting **[w]** www.cinema4d.com

The question

Who is the developer of *Cinema 4D XL 6.1*?

To enter

Simply click the CurrentCompo button from the *Computer Arts Special* CD interface and then enter *Cinema 4D XL 6.1* as the competition name.

Then select your answer and fill in all the other details and click Submit Entry. Don't worry if you're not online, you can still enter by post.

Just write your answer on a postcard and send it to *Cinema 4D XL 6.1* Compo, *Computer Arts Specials*, 29 Monmouth Street, Bath BA1 2DL. Include a phone number where you can be reached during the day.

The rules

The closing date is 17 December 2000. Employees of The Future Network, Hisoft and any of their agents or families may not enter the competition. One entry per reader. The editor's decision is final. No correspondence will be entered into and there is no cash alternative. No purchase necessary.

Illustration: George Cairns

Monster 3D

Plunge into *Pixels 3D Studio 3.6* with this prehistoric sea creature, created using simple NURBS primitives. Thanks to an IK skeleton, it's also pose-able

If you're looking for a 3D modelling application to run on your iMac, your two main concerns may well be that the package should be as versatile as *Maya* but cheap enough to afford out of your own pocket. If so, then *Pixels 3D* must be the package that most closely matches that brief. A browse through the demo version will reveal how similar its interface is to *Maya*'s. A combination of keyboard shortcuts and mouse clicks enables you to navigate round the interface and manipulate objects in a very user-friendly way. It also has excellent modelling tools and a sophisticated shader maker. At a fraction of the cost of *Maya* you'd think using *Pixels 3D* for our aquatic project would be plumbing the depths. Not so – *Pixels 3D* can swim with the big fish. Before you begin your project, you need to get into the habit of good housekeeping. Open *Pixels 3D* and set up a New Project from the File menu and name it Denizen Project. This will give you a main folder containing sub folders for geometry, textures, and the like. Right. Let's make that monster!

Tutorial files

The completed monster model file can be found on the cover CD. When you create a new *Pixels 3D* project, place the Denizen scene in your *Pixels 3D* Geo folder. Place the three reference images in the Img folder. (right.picture, front.picture, top.picture).

On the Web

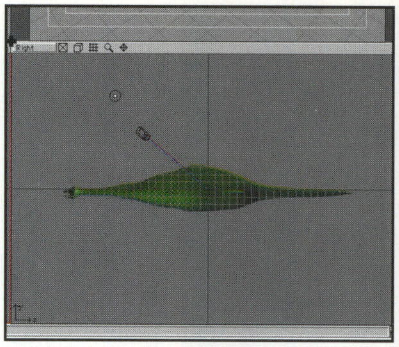
George Cairns is an illustrator and feature writer who regularly contributes to *3D World* magazine. Check out his 3D work at **[w]** www.georgecairns.com. Download the latest demo for *Pixels 3D* from **[w]** www.pixels3d.com To turn the 3.6 demo into the full version you'll need to register it. You can do this for free at **[w]** http://store.pixels.net/computerartsfr/register.lasso If you like the package you can then upgrade to *Pixels 3.7* for $99

Part 1: Building the body

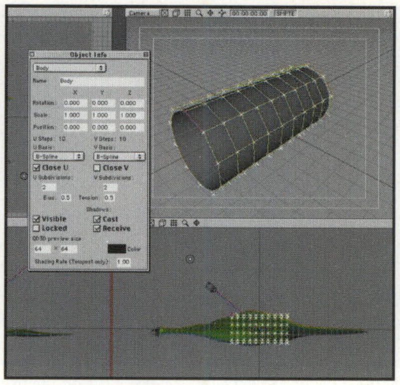
The bulk of the model is going to be one NURBs cylinder. We'll define the shape, width and length using v- and u-steps to match a reference image

View panels

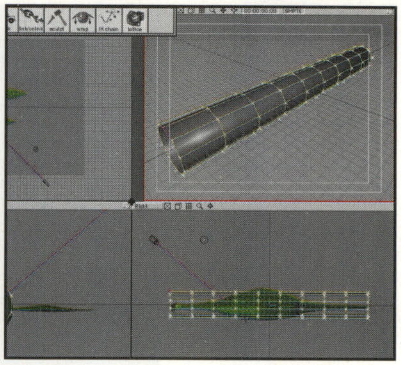
You can customise your view panels to show various components in the scene by going to each panel's View Options and clicking on Drawing Options. You can also make a view panel fill the whole screen by clicking in the little square at the top right of the view's window.



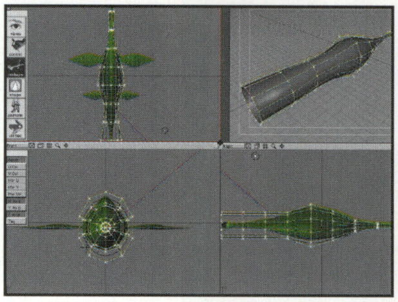
1 When modelling in 3D, it's handy to have reference images to work against. In the right view Options box click on Image. Import your reference image (CD right.picture) into the Texture Manager. Apply it and it will now appear in the right view window. Import the other reference images into the front and top views in the same way, (CD front.picture and top.picture)



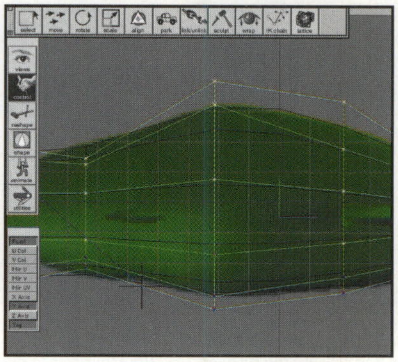
2 From the Shape Tools menu create a Cylinder. Press Command plus I to open up the Object menu. Change the name of the cylinder to Body. It's good practice to give your objects names – it makes life a lot easier when you're organising dozens of components.



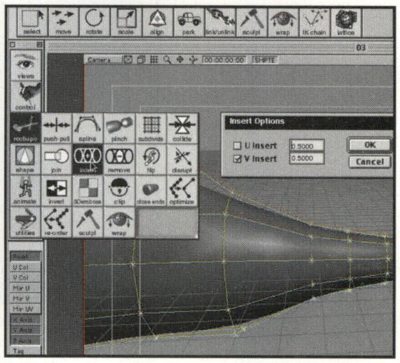
3 Scale the cylinder along the z-axis until it's an appropriate length for your beast. Ensure that you only scale along the z-axis by turning off the y and x options in the Constraints Palette. Notice that only the Perspective view is showing a shaded version of the cylinder. This keeps processing demands to a minimum.



4 The NURBS cylinder consists of curves with v-steps defining its width and u-steps defining its length. Select the Pinch tool from the Reshape menu. In the right view select a control point on one of the v-steps by clicking on it with the Command key pressed down. Click/drag with the mouse and you'll see the whole v-step being pinched towards its centre point. Do this with each v-step till the cylinder roughly matches the profile of the reference images.

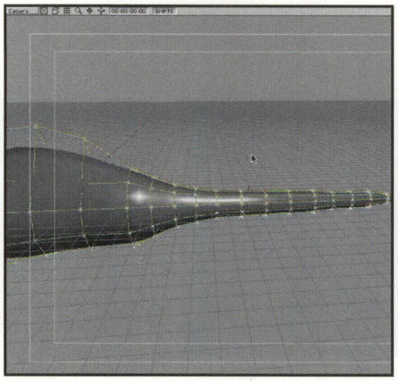


5 Pinch has only got us part of the way there. Click on Tag in the Constraints palette. Now you can select individual points along the base of the beast. Select the Move tool and move them up in the y-axis till they align with the reference image. Pinch and move points around till your cylinder matches the reference images in every view.

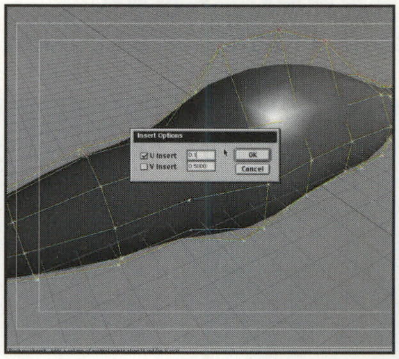


Insert Options
☐ U Insert 0.5000
☑ V Insert 0.5000

6 Let's give our creature a more detailed tail by adding some extra v-steps in the tail area. Select a control point on the v-step near the end of the tail. Go to the Reshape menu and click on Insert. In the Insert Options menu click on V Insert. This will add a new column of control points to the mesh along the v -axis. Add some more of these steps.

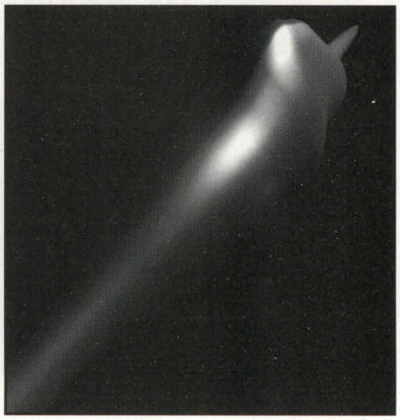


7 Here's the tail with the extra v-columns. Inserting extra v or u-columns is a useful way of building up a more complicated model from an initially simple shape. Stretch out the tail a little by tagging the control points at the end and moving them along the z-axis.



Insert Options
☑ U Insert 0.1
☐ V Insert 0.5000

8 To give the impression of a spine running along the beast's back select the u-column option from the Constraints palette. Click on a point along the beastie's back and you'll see that the whole column is selected. We're going to insert another column virtually on top of the one we've got. Choose an insert value of 0.1



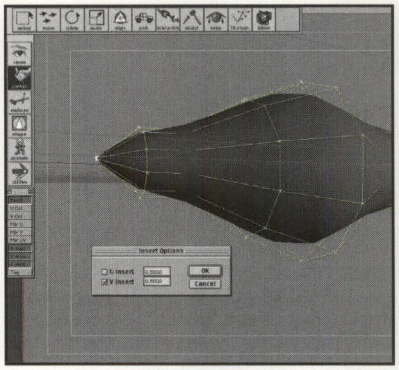
9 Press Command and R to do a test render. You'll see more of a crease along the back because of the extra u-column. Add another if needed to get an even sharper crease.

Part 2: Heads up

Let's fine-tune our creature's facial features using the Tag and Move tools

Lock components

Use the Object Manager to lock components that you don't need to move but still need to see. This stops you selecting or moving them by accident and makes it easier to work on the desired object.



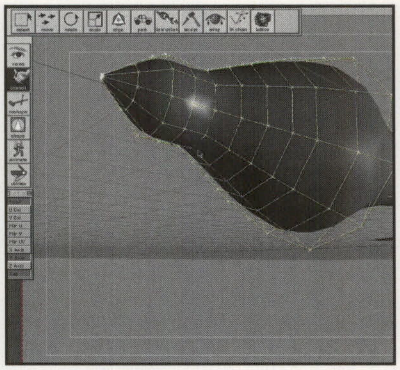
Insert Options

☐ U-Insert 0.5000

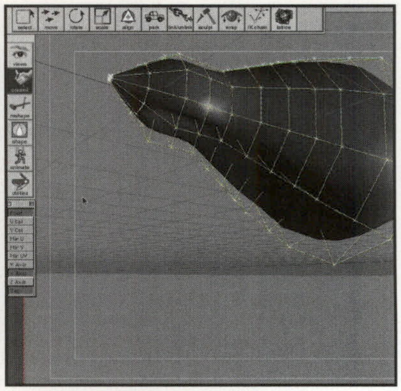
☑ V Insert 0.5000

OK Cancel

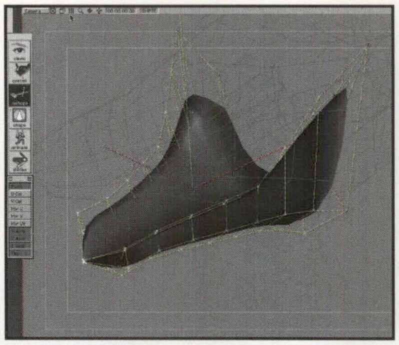
1 Pinch the cylinder at the other end to get a rough head shape. The head is important as it'll make or break the effectiveness of our 3D character. For a more detailed head, insert some v-steps into that part of the cylinder.



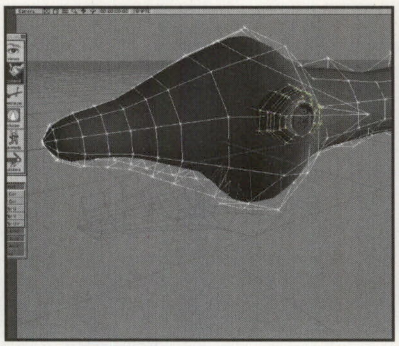
2 Click on Tag from the Constraints palette to select individual points on the underside of the head. Hold down the Shift key if necessary to add more points to your selection. Choose the Move tool from its icon (or press keyboard shortcut Q).



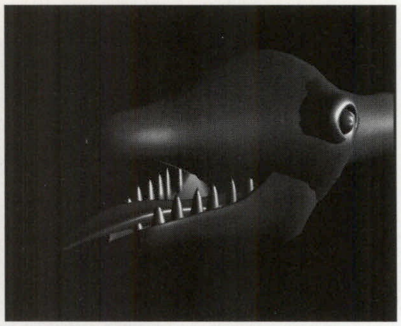
3 Constrain the x and z-axis so the selected points can only move in the y-axis. Move them up into the head to create the upper part of the mouth cavity.



4 Create a new cylinder. Use Tag to select points along the top section of the cylinder and move them down the y-axis to half collapse the cylinder. Then from the top view pinch the jaw so it's narrower at the front. Use the Tag and Move tool to pull up points at the rear of the jaw.



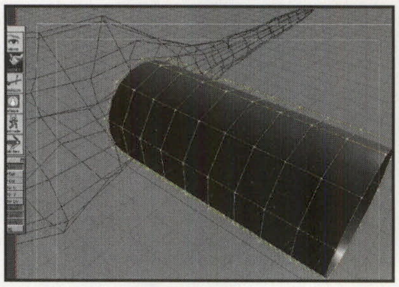
5 The eye socket is created by cutting a sphere in half along the x-axis using the Clip tool. Use the Move tool to push tagged points at the end of the sphere inside itself as if you were squashing a tennis ball. Another sphere placed inside will serve as an eyeball.



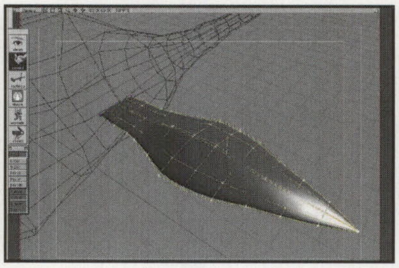
6 Make a tooth from a cylinder. Pinch and scale it until it's nice and pointy. Duplicate as needed. The tongue is made in the same way as the jaw. Because you want the tongue to hinge at its rear choose the Centre tool. You can now offset the centre point of the object so that it will rotate at the back of the tongue like a hinge.

Part 3: Fin-tastic appendages

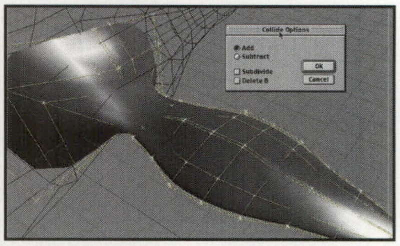
Our creature won't get far without a method of propulsion



1 Create a new NURBS cylinder and place it over the fin reference image in the top view. In the same way as you reshaped the body cylinder scale, pinch and move control points until you have a suitably fin-shaped cylinder. Insert a couple of extra u-steps along its length to imply the back bone.



2 Now we're going to make the fin merge more effectively with the body. Select the body using the Object editor and lock it. We can now work on tagging points on the fin that fall inside the body without accidentally selecting it too. Use the Shift key to add more points to your tagged selection if neccesary.



Collide Options

● Add

○ Subtract

☐ Subdivide

☐ Delete B

OK Cancel

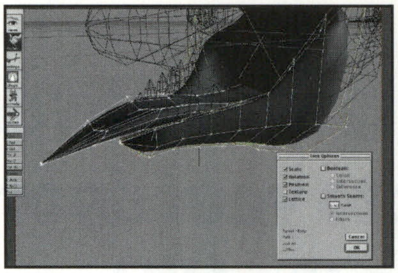
3 Turn off the Tag option and select the body. While holding the Shift key also select the fin. From the Reshape menu click on the Collide tool. The tagged control points of the fin will collide with the geometry of the body. The fin now looks like it's part of the main body. Select it and duplicate the fin. Then flip the copy to the other side of the beast using the Flip tool.

Part 4: Chain of command

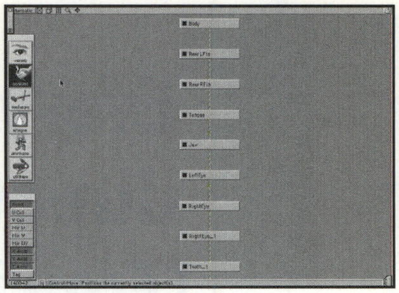
Now we need to link unconnected parts together in a hierarchical order

Parking

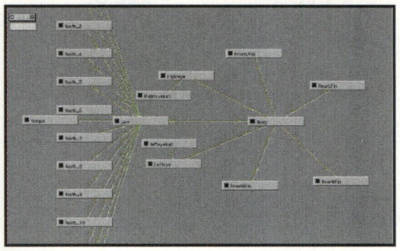
Once you've made and positioned an object, click on Park. This removes the object's previous scale and translation values. Objects are easier to link together if they all share the same parked co-ordinate system.



1 It's a good idea to link your objects together so that when the body moves, the teeth, eyes and tongue move with it. The tongue and teeth should link to the jaw which in turn should link to the main body. Select the tongue. Shift-select the jaw. Click on Link/Unlink. The tongue is now a child of the jaw. Do this with all the beastie's bits.



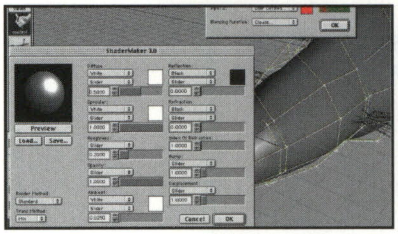
2 Change the top view to the Schematic view. This view is really useful when it comes to organising your model's parent/child hierarchy. Here you can see a label for every component in your scene. Arranged like this it's not much help as everything is displayed in a long scrolling line.



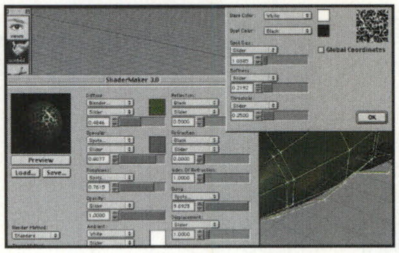
3 Move the schematic labels around so that they correspond in a visual way with your actual model. This gives you a more user-friendly representation of how each object relates to other objects in the scene. You can see hierarchical links via the arrowed green lines. You can also select objects in your scene by clicking on their label in the Schematic view.

Part 5: Texture

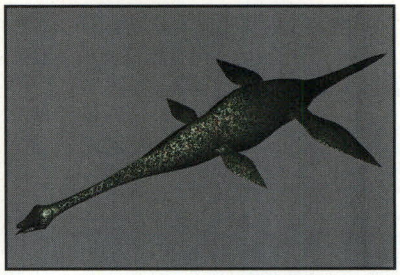
Pixels 3D enables you to import and apply texture maps



1 Let's start with a basic colour mix for the body. Click on Command and W to open the Shader Manager. From the Load A Shader box, click on New Shader. The Shader Maker 3.0 window appears. Click on the Diffuse option. Select Blender. Choose two User Defined colours to blend together. Use Clouds as the Blending Function to get a nice random blend between the colours.



2 You can create glistening wet highlights on your texture by adding a spot value to the Specular controls of the shader. Now the Specular highlights have a more random watery look instead of a billiard ball style shiny sphere. Also add a Spot effect to the Bump map to give the skin a more organic texture.



3 Apply your main texture to the fins, jaw and eye sockets. Go back to the Shader Manager and create separate textures for the teeth and tongue. Press Command and R to do a test render. The Shader Maker is very sophisticated so it's worth experimenting with all the other options there.

Part 6: Inverse kinematics

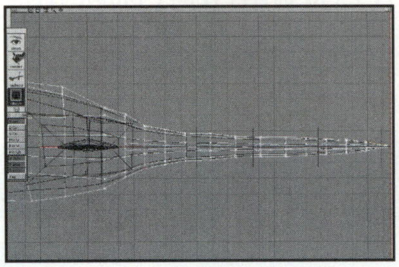
Let's add a hierarchical skeleton to the body to complete our model

IK chains

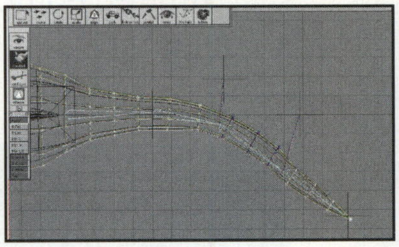
Adding and linking an IK chain to your model can be fiddly. Practice linking an IK chain to a simple NURBS cylinder first of all. This will give you a better understanding of how the system works in *Pixels 3D*.

Smooth bends

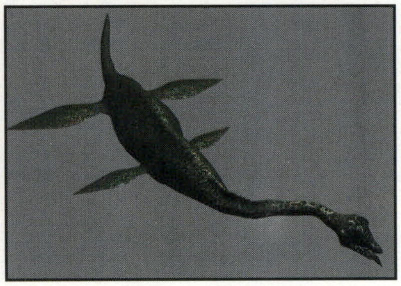
To get more smooth bends in your mesh open the Point Info panel and reduce the weight of the v-columns that are attached to the IK chains. Now the v-columns aren't bound so rigidly to the joints.



1 Let's start with joints for our beastie's tail. Select the IK chain tool from the Shape palette. Click from the top to the tip of the tail to create the chain. Double-click to finish. Now select the body mesh. In the Schematic view hold down Shift and select the Root Joint. Select the Link/Unlink Tool and click OK. You've now linked the body to the bones.



2 Select the body, then press Tag. Select some control points at the tip. In the Schematic view, Shift-select the last tail joint. Click on Link/Unlink. Click OK and Turn off Tag. Select the joint you linked the end of the tail to and move it. You'll see the tip of the tail move with the joint. Now tag the next group of points to the joint nearest them and work up the tail to the root joint.



3 Add another chain of IK joints for the head and neck. This time don't link the whole body to the neck root. Link tagged neck points to the appropriate neck bones instead. Your beastie is now ready to be released to run as wild as your imagination will let him.

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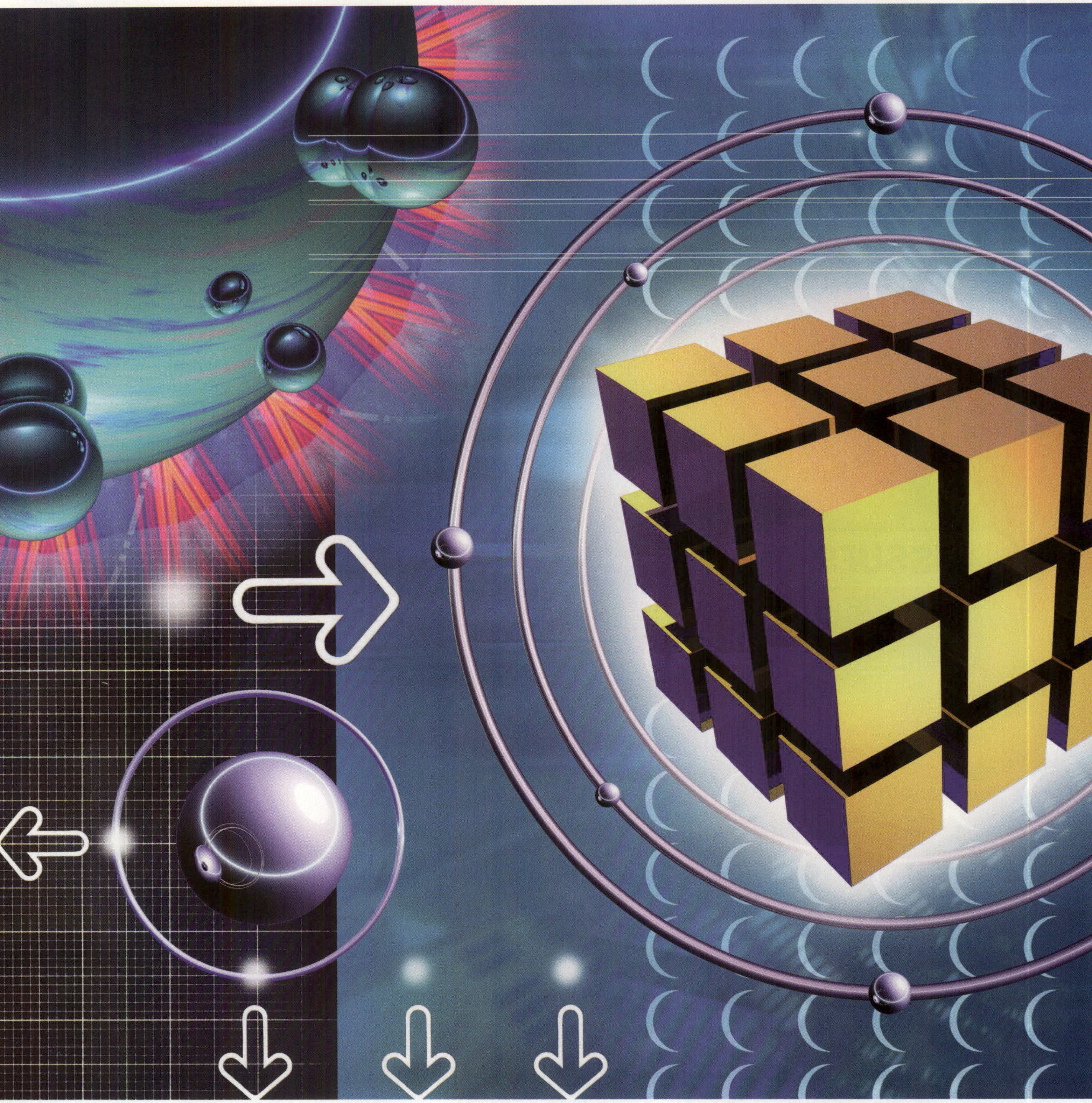


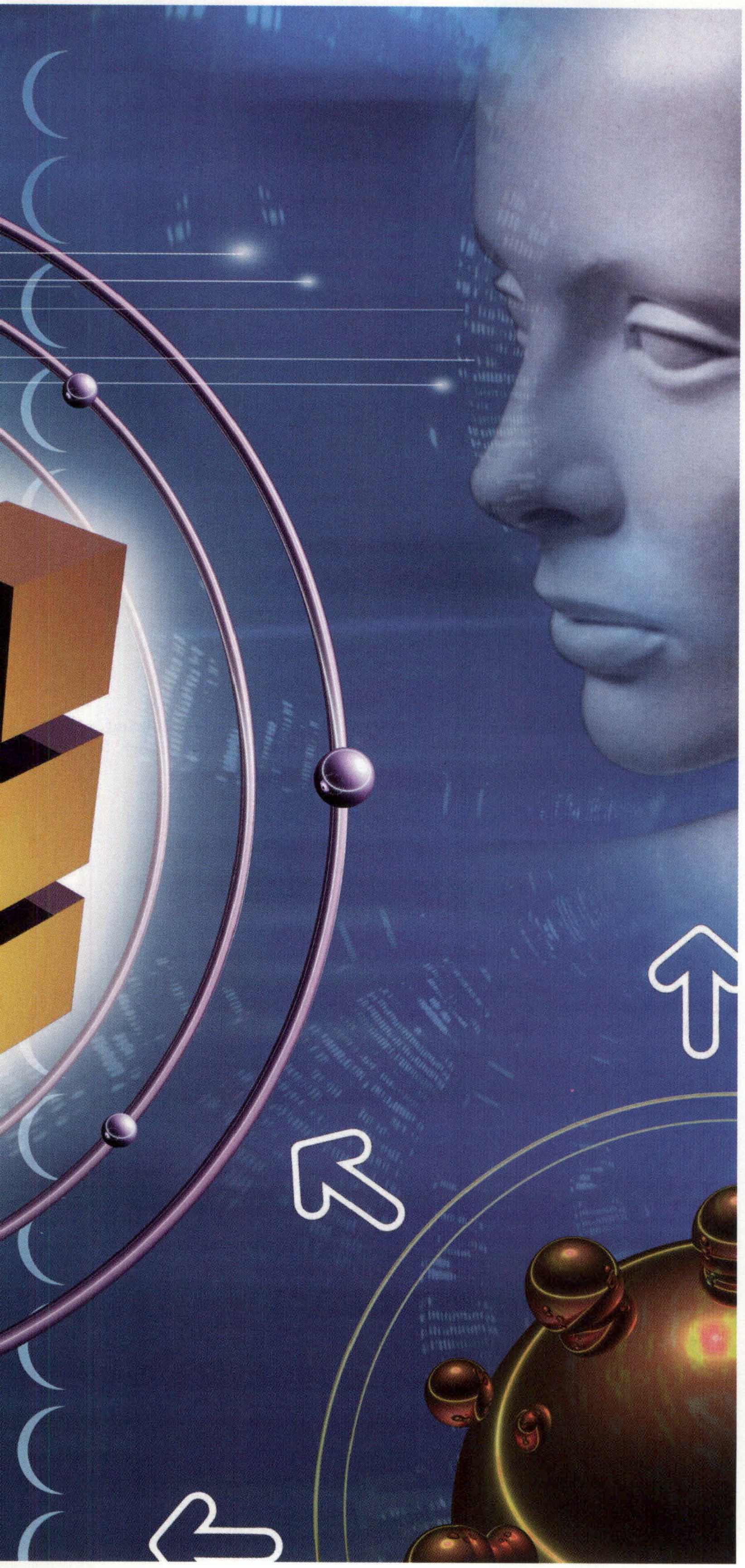


Illustration: Gone Loco. **Telephone:** 020 7636 1064 (Debut Art)

The light stuff

There's a certain 'something' that makes some renderings look more realistic or professional than others. In many cases, it's all down to lighting

The first rule of good lighting, especially for beginners, is keeping your lighting scheme simple and controllable. Using too many lights in a scene can slow down your rendering and make it difficult to adjust and improve your lighting. You should only add a light to the scene when you know exactly what purpose it serves.

For a simple, effective lighting scheme, start by using only one light source. Make sure that there is no Default or Ambient light in your scene, so that shadow areas appear pure black. Adjust a Spot light so that it is higher than most of the objects in your scene, and positioned to the left or right (but not dead-centre) relative to the camera.

Create a low-resolution test rendering, and make sure that you are happy with the lighting, shading, and shadows from the one light source. The single-light rendering should look almost fully lit, except for the darkness of the shadow areas.

Once you have completed a single-light rendering, you can add other lights to complete a popular Hollywood lighting set-up called Three-Point lighting. Three-Point lighting consists of three kinds of lights, Key, Fill, and Back. The main light source that you have already positioned and test-rendered by itself is the Key light.

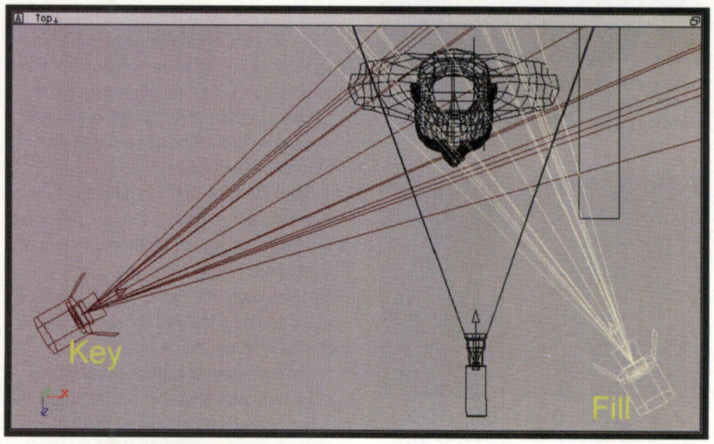
Fill lights are extra lights that extend the illumination from the Key and lighten your shadow areas. To make a Fill light, add a light source that is half as bright as the Key light (or less - in a high-contrast scene, sometimes a Fill light is only a tenth the brightness of the Key).

Position it in a generally opposite angle from the Key - if the Key light is on the upper right, then the Fill should be on the lower left.

The Fill usually doesn't need to cast shadows, but it will fill in the shadows created by the Key and make the scene's lighting appear less harsh.

If you give the Fill light a slightly different tint to the Key, there will be more colour variation in your scene and the Fill can provide the shadow areas with contrasting colours.

A Back light is a special light positioned to create a rim of light around the edge of an object, or to highlight the top or side of your object. The rim of light created by a Back light can help separate an object from the background behind it. Back lights are an optional part of a Three-Point

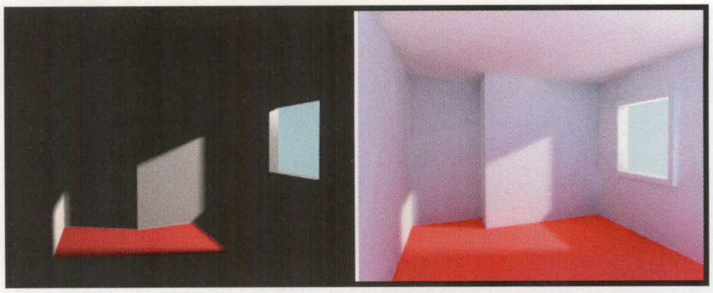


Position your Fill light on the opposite side of your model to the Key, so that the Fill light begins shading the model where the Key falls off.

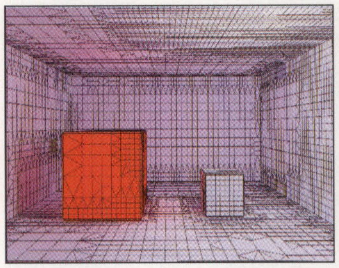
Preparing your scene

For the best results, here are five things you should check before you light:

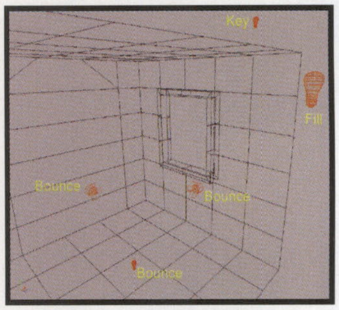
1. Bevel the edges between surfaces so that they can catch highlights and illumination from diagonal angles. Imitate the way surfaces meet in real life, such as the edge of a table or the corner of a room, where there is usually a bevel or molding instead of a perfect right angle.
2. Assign colours and textures so that your models reflect a realistic amount of light. You may find exceptions to this guideline, but as a starting point, keep colours within a realistic range of 25 per cent to 85 per cent brightness (not pure white or pure black), and avoid extremely saturated colours.
3. Build an environment completely surrounding your models if they are reflective or transparent. Raytracing in an incomplete environment can darken parts of your models no matter how they are lit.
4. The camera angles should be determined before the lighting. Some lighting functions (such as Back lights) can't be positioned without knowing the camera location.
5. Turn off any Ambient or Default lighting, so that when you add your first light, there isn't any other illumination in the scene to dilute the effect.



The left lacks indirect lighting. On the right, indirect lighting is simulated, so that the sunlight bounces around the room, and even reflects the floor colour on to the ceiling.



A progressive radiosity solution adaptively adds more polygons in areas where shading and shadows vary. Note the 'colour bleeding' effect where light reflected from the red cube slightly tints other parts of the scene.



Adding your own Bounce lights behind each illuminated floor or wall can nicely simulate indirect light.

lighting set-up, and if they are overused they can sometimes make a scene look stylized and less realistic. If you want to create a Back light, make sure that your camera is in its final position, then add a bright light source above and behind your subject, almost directly opposite to the camera. Do a test rendering to make sure the rim of light highlights the correct edge of your object.

The essential goal of Three-Point lighting is a process sometimes called 'modelling with light'. You are trying to render a 2D image that communicates the modelling of a 3D form.

To accomplish this, different sides of your model need to be shaded with different tones, so that each change of angle in your surface produces a change in the shading. More delineation can also be added by shadows, texture, and the rim lit by your Back light.

A single-light rendering (lit only with a Key light) has high contrast and black shadows, but otherwise appears complete.

A rendering with Three-Point lighting is mainly lit by the Key light, but has the shadows filled in by the Fill light, and a rim of Back light adds definition to the back edge of the head.

Indirect light

In real life, objects can be illuminated by indirect light, which is light that has reflected off another surface, instead of coming directly from a light source.

For example, if a bright light was aimed at the ceiling of a room, light reflected from the ceiling would indirectly illuminate the floor and walls. Most renderers do not automatically simulate this effect, unless you have activated a radiosity or global illumination option.

To add the appearance of indirect light to your scenes, the most common production solution is to create extra Bounce lights: lights that emerge from the same directions as you'd expect light to be bounced.

Your Bounce lights usually don't need to cast shadows, so they can shine right through walls and floors. If a lot of light is hitting the floor, you can simulate light reflected up from that direction by simply placing Bounce lights underneath the floor.

An increasing number of programs have radiosity or global illumination functions which can calculate light bouncing between surfaces for you, so that any brightly-lit surface essentially works as a light source, adding soft indirect illumination to your scene. Here are a few quick definitions of the functions available:

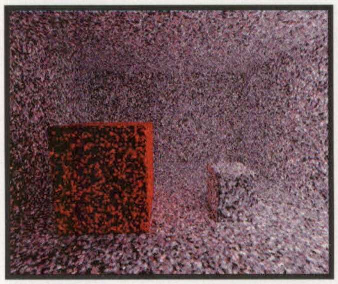
Global illumination is the blanket term for all rendering techniques that calculate indirect illumination and light transmitted from other objects.

Contrast global illumination with local illumination, rendering in which no other objects are taken into account when a surface is shaded. Radiosity is a popular approach to rendering indirect light, in which light is transmitted between surfaces by diffuse reflection of their surface colour.

Radiosity can be calculated progressively, so that light can bounce as many times as needed to create a refined, accurate simulation of real lighting. Most programs calculating radiosity store shading values for each vertex in your geometry, so very complex models take a long time to light. Radiosity can be pre-computed before rendering a fly-though animation – if the lights and objects don't move, then there's no need to recalculate at each frame.

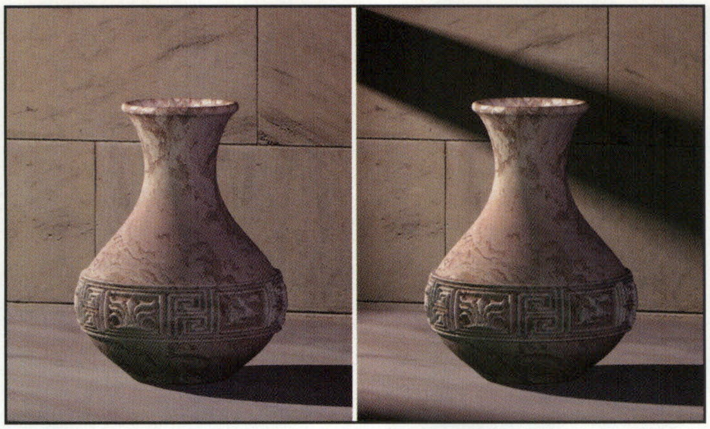
However, it is very difficult to use conventional radiosity in an animation if there are moving characters, doors opening, or other animation that would change the indirect light at each frame.

Photon mapping is another approach to calculating indirect lighting. The same kind of results calculated by conventional radiosity can also be rendered via photon mapping in some programs. With

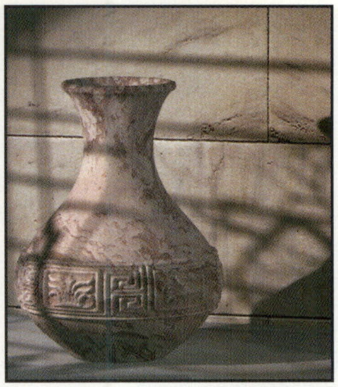


Photon mapping provides another approach to solving the same problem as Radiosity. Instead of needing lots of polygons to store its shading information, a separate photon map (photons shown as small dots here) stores the information.

Caustics are best known for producing shimmering patterns of light reflected off water, although they can also achieve many other effects.



A primitive cube was scaled and positioned to add an extra slash of shadow on the back wall, making the top of the vase stand out better from the wall, and improving the composition.



Projecting a texture map from a Spot light can add to the impression of off-screen space, making the scene look more complex without you having to model extra detail.

photon mapping, a separate data type, the photon map is created to store the global illumination solution.

The resolution of a photon mapped solution is adjustable independently from the resolution of the geometry. When necessary, photon maps can be recomputed at each frame of an animation.

Caustics simulate specular light transmission, where indirect light remains focused in a shape or pattern, such as light glinting off a metal object, reflected by a mirror, focused through a magnifying glass, or reflected by a water surface into shimmering patterns.

Caustics nicely complement radiosity, which calculates only diffuse light transmission such as light reflecting off a plaster wall. Caustics can be rendered via photon mapping or other advanced raytracing approaches. (Some renderers include photon mapping specifically to render caustics, even if they don't use the photon maps for the diffuse light transmission at all.)

Outdoor lighting

Simulating outdoor lighting benefits from using Directional lights (also known as Direct, Infinite, Distant, or Sun lights in different programs), which set a single vector for all of their illumination and hit every object in the scene from the same angle. Directional lights are perfect for simulating illumination from very distant light sources such as the sun.

Daylight hits outdoor objects from every angle, not just one, so you may need seven or eight Directional lights for a realistic daylight set-up. Start with one bright yellowish Directional light for light from the sun – this main light is probably the only one that needs to cast shadows.

Add two or three Directional lights with a blue tint and a lower intensity, coming from other angles in the sky. The warmer tone of the sunlight and the cooler skylight colours should balance so that a white surface still looks white and colours are properly reproduced in your scene.

As a final touch, simulate light reflected back up from the ground by tinting a few more Directional lights to pick up colours from the ground. Give them a very low intensity, and aim them upwards to light the underside of your objects.

An array of Directional lights providing different tones from different angles can also serve as a higher quality alternative to using Ambience in your scene. You can leave your Ambience at zero and still have a base level of illumination to fill in your shadow areas. Unlike Ambience, an array of Directional lights can add a realistic variety to the tones and shading of your surfaces, instead of flattening your scene with the addition of a constant value.

Some programs have features for rendering a similar effect based on a High Dynamic Range Image (HDRI) for the surrounding environment.

An HDRI is a special kind of texture map that stores an expanded range of brightness information in order to record all of the lighting reaching a point in a scene.

This makes for an easier pre-set daylight effect, because you only need to map one HDRI on a sphere instead of arranging several lights. However, the HDRI approach makes it more difficult to interactively adjust and fine-tune the colours coming from each direction, and usually takes longer to render than an array of Directional lights.

Improving your scenes

An effective use of light and shadow should add to the impact and composition of your scene by directing a viewer's eye to the areas you want noticed first, and de-emphasize distractions.

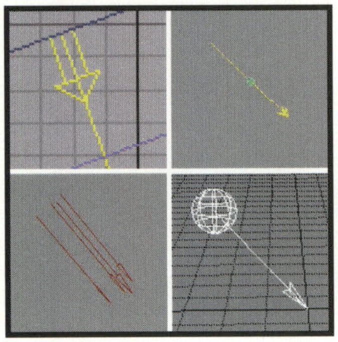
Good lighting can sometimes hide flaws and omissions in a scene. For example, if there wasn't time to model all of the people in a theatre audience, you might allow most of the auditorium to fall into darkness, and focus your lights on the stage or other centres of attention.

There's always more than one way to light a scene, even if a project is confined to strict realism.

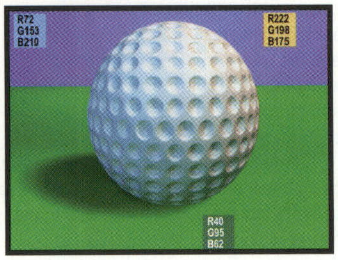
Feel free to add beams of light and slashes of shadow wherever you feel that they would add to your composition. The most common error in lighting is neglect – people pay too little attention to the creative possibilities that lighting offers a 3D artist.

An extra shadow in an undefined area can bring a scene to life. Experiment with your lighting as a way to add contrast, colour, and emphasis to your 3D scenes, and you could be richly rewarded with much better renderings.

Jeremy Birn is a freelance 3D artist and the author of the new book *Digital Lighting & Rendering*. You can read and discuss more about 3D lighting and rendering online at **[w]** www.3dRender.com.



Directional Lights (aka Direct, Infinite, Distant, or Sun) appear differently in different programs, but all serve the same purpose.



Rich, realistic lighting benefits from a diverse range of colours, based on the colours of different direct and indirect light in the scene.

Digital Lighting & Rendering

Jeremy Birn, the writer of this article, is the author of a new book for 3D artists called *Digital Lighting & Rendering*. The volume shows how to apply advanced Hollywood cinematography techniques to create realistic 3D graphics. Techniques that work in any leading 3D rendering software are explained, covering lighting design, texture map creation, cinematic camera work, raytracing, radiosity, multi-pass rendering, compositing, and hundreds of artistic and technical guidelines to help you produce better renders. *Digital Lighting & Rendering*, from New Riders Publishing, is available in UK bookshops. You can sample the first chapter at **[w]** www.3dRender.com. For more book reviews turn to page 85.

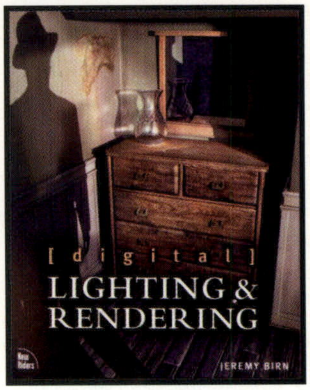


Illustration: Andrew Moffit **Email:** drew@netman.com **Telephone:** 001 507 390 3794

Using Strata 3D

It's not only filled with features and functionality, but it's free as well – something which should endear *Strata 3D* to graphics designers…

Strata 3D, free from Strata Software: **[w]** www.strata.com (a division of 3D.com) **[t]** 1 435 628 5218. Upgrade from Strata 3D to Strata 3D Pro – $495.00. Strata 3D Pro – $595.00. Expertise provided by Andrew Moffit, 3D graphic artist and Web designer. Owns and works at AE Studios. **[e]** drew@netins.net.

Software on disc

You can find the full version of *Strata 3D* on the coverdisc. Turn to page 7 for more details.

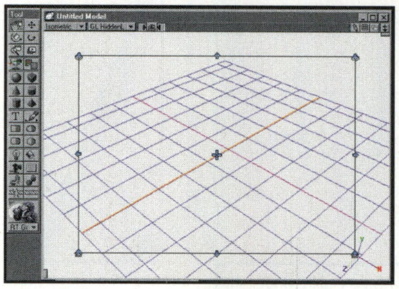
Although *Strata 3D* isn't the most well-known of design programs, there are numerous likeable things about the program. You only have to take a look at the high-quality results that can be achieved with *Strata* to get an idea of program's popularity and capabilities. For more examples of what can be done, view some of the galleries at *Strata*'s Website.

Strata 3D is the little brother of Strata Software's more advanced package, *Strata 3D Pro*. The company offers the program free to anyone that wishes to use it as a download or shipped on a CD. It comes with an online manual which should answer any start-up questions and get you started quickly. There are also plug-ins available for the package and an option to upgrade to the professional version.

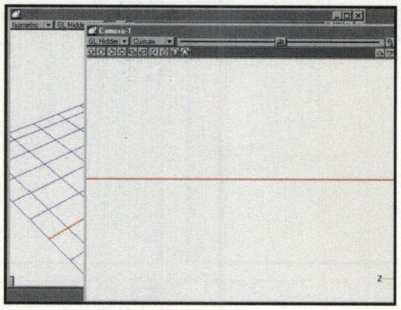
After using the program you may in fact be so impressed with it that you'll upgrade in a jiffy, but the features included in the free version are quite impressive in themselves. This tutorial shows you how to use *Strata 3D* to create an architectural scene complete with effects.

Part 1: Starting the project

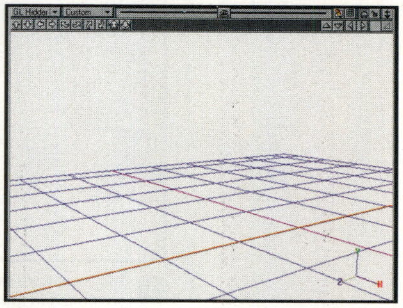
Camera controls and a tools overview, including renders



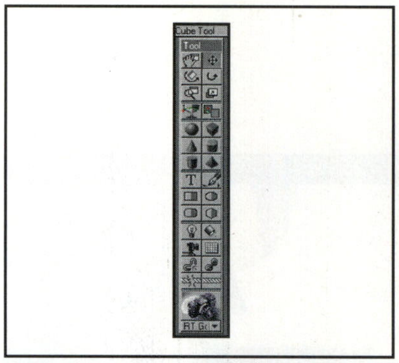
1 Create a new project and familiarise yourself with the navigation controls. *Strata* has given you ready-access to all the camera and object controls within the scene itself allowing for easy navigation and object manipulation. You might want to start by creating a camera to view your project from.



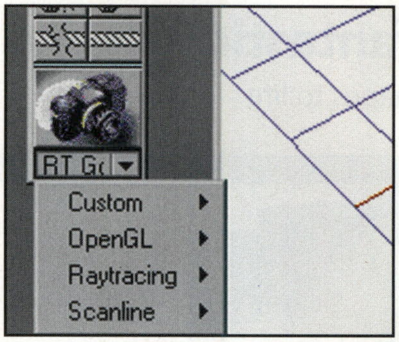
2 To position the cameras, go to >Windows >Camera Windows >Camera-1. You now have two windows open. You can position the camera using the Object Positioning tools or by using the camera controls (top left and right arrows) in the Camera View window.



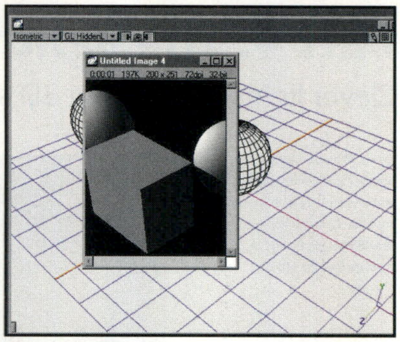
3 Manipulating the slider at the top zooms in and out of the scene. Controls for the View mode are available as well as Aspect Ratio. Get the camera into a position where you can view the grid easily. Later you will have to change this to get the best view of the scene.



4 *Strata* has a wide range of common tools available in the main toolbar. Many of these tools are right-clickable to access Properties. Above the toolbar is a status bar that gives you information about what each tool does.



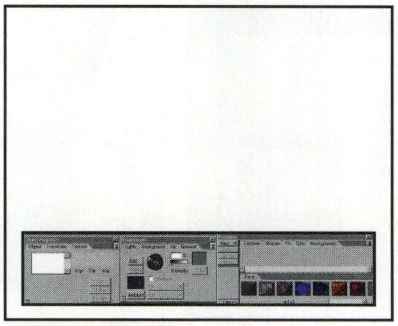
5 Now to select the renderer. At the very bottom of the toolbar you have a dropdown list where you can select the various Render modes for Final Output and Preview renders. Usually while working on the scene it's best to use a lower render setting to speed up workflow.



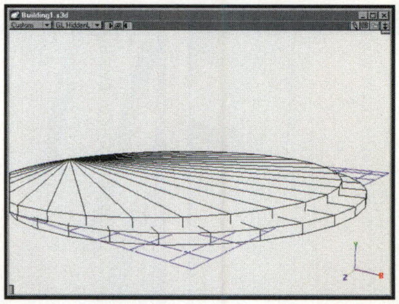
6 Click the camera icon then click and drag to define an area to render in your work windows. This will render any portion of the screen that you define. Or you can click once with the camera icon on a window and render the whole window.

Part 2: Floors and walls

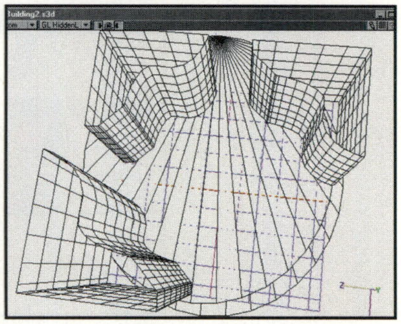
Making a start on laying the foundations



1 You will also notice three menu boxes at the bottom of your screen – Object Properties, Environment and Resource. You will use these throughout the project. Many of the menus have an Advanced mode that can be turned on by clicking the down arrow at the bottom left.

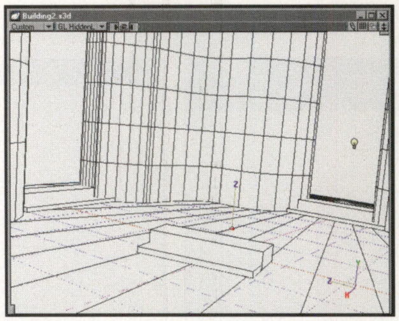


2 Now for the floor. Select the Cylinder tool and click once to draw the shape. Click again to define the 3D height. Using the Edit tools or keyboard shortcut, copy and paste the object to create your second set of stairs. Move these into position slightly out and down from the current object.

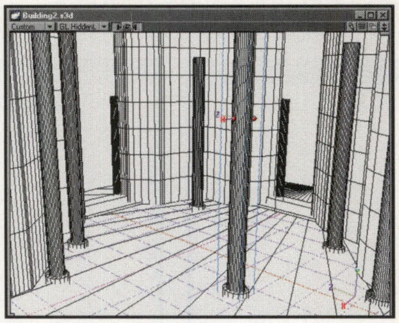


3 Use the Bézier Pen tool to draw the top-down view of the wall shapes. By using the Reshape command you can edit the shape after creating it. Use the Extrude tool to give the walls height and then copy, paste and rotate them into position to form the three walls.

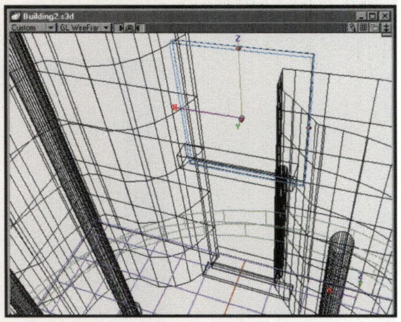
Part 3: Stairs, and walls again



1 The stairs were simple – two rectangles were positioned to form the two steps and then grouped together with the Group command (Ctrl+G, Command+G). After grouping the first set of rectangles, it's easy to copy the object and rotate it into the other two positions between the walls.



2 Create the pillars with very tall cylinder shapes and position them first so to make it easier to get the layout correct. When you're happy with their positioning, use another cylinder at the bottom of each pillar to form the base. The doorframes are smaller copies of these pillars.

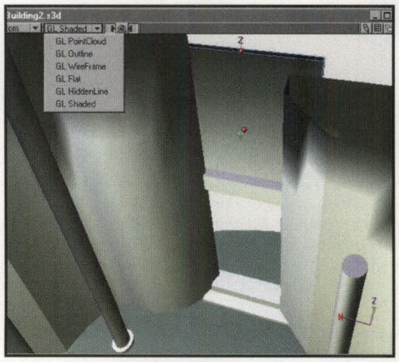


3 A small section of wall above the door on the left is visible between the curved walls. Add a rectangle here for the flat surface of the wall. The top part of the door frame also needs something – a rectangle (like the one used here) or a cylindrical shape.

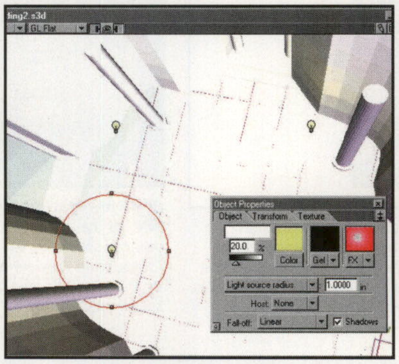
Part 4: The light fantastic

Clever light effects bring 3D shapes to life

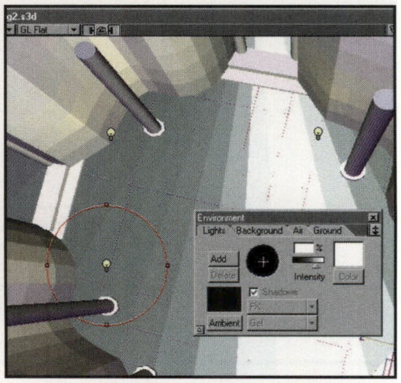
Strata 3D has some very cool lighting capabilities including environmental lights that enable you to light a scene with Directional lights or add a constant Ambient effect.



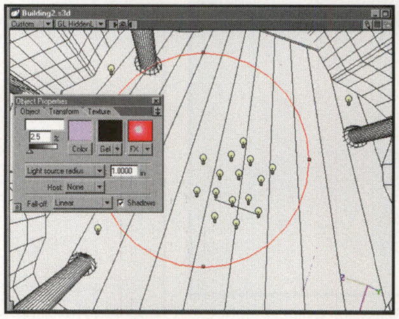
1 At this point you can began switching your Viewing mode back and forth depending on what area of the scene you're working on. You may wish to see through your objects for alignment purposes. You can switch modes by using the top left dropdown menu on the View window.


Object Properties
Object · Transform · Texture
20.0 %
Color · Gel · FX
Light source radius 1.0000 in
Host: None
Fall-off: Linear ☑ Shadows

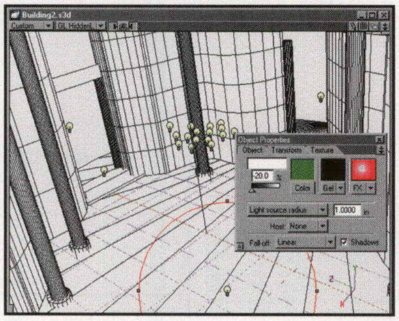
2 This image uses Point lights only. Position the lights next to the pillars and set them at an intensity of about 20 per cent using a light yellow colour. These will be used as the Ambient lighting in the scene and also for the light effect coming from the glowing orbs. Set the Falloff to Linear.


Environment
Lights · Background · Air · Ground
Add
Delete
Intensity %
Color
☑ Shadows
FX
Ambient
Gel

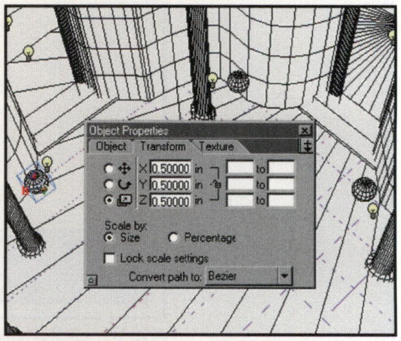
3 Remove the environment lighting first by selecting the light in the Environment menu and then deleting it. This should cause your scene (if you're displaying in Solid mode) to go dark except for the three low-level lights placed in it.


Building2.s3d
Custom · GL HiddenL
Object Properties
Object · Transform · Texture
2.5 %
Color · Gel · FX
Light source radius 1.0000 in
Host: None
Fall-off: Linear ☑ Shadows

4 For the main lighting, add a Point light and set the intensity to 2.5 per cent. Now create a cluster of these lights in the centre of your scene. Vary the positions as well as the colour (ranging between blue, red, yellow) to simulate the effect that the stained glass window will have on the floor.

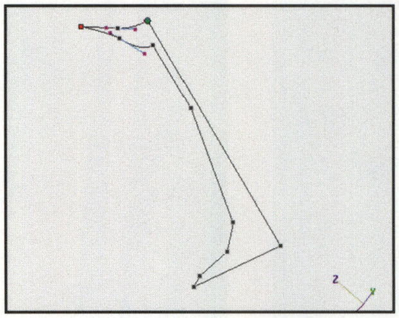

Building2.s3d
Custom · GL HiddenL
Object Properties
Object · Transform · Texture
-20.0 %
Color · Gel · FX
Light source radius 1.0000 in
Host: None
Fall-off: Linear ☑ Shadows

5 *Strata 3D* will enable you to set up lights with a negative value in order to 'suck' light out of the scene. Add three negative lights to the scene set at 20 per cent – one in each doorway and one toward the bottom right of the scene. This will enable you to control the darkness of those areas.

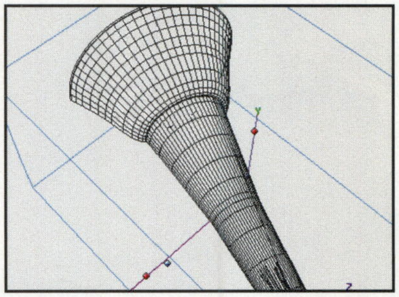

Object Properties
Object · Transform · Texture
○ X 0.50000 in to
○ Y 0.50000 in to
● Z 0.50000 in to
Scale by:
● Size ○ Percentage
☐ Lock scale settings
Convert path to: Bezier

6 The orbs were made from spheres. Copy three of them into the scene next to the pillars. Make sure that they are perfect spheres by using the Object Properties panel and the Transform tab. Here you can manually input the XYZ size co-ordinates.

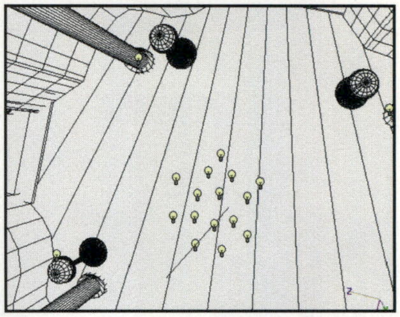
Part 5: Forming pedestals Create control points using the mouse



1 Use the Bézier Pen tool to draw a profile section of the orb stand, and use the Reshape mode to tweak it. For those unfamiliar with this tool and similar ones – by holding down the mouse you can create control points that define curves as well.

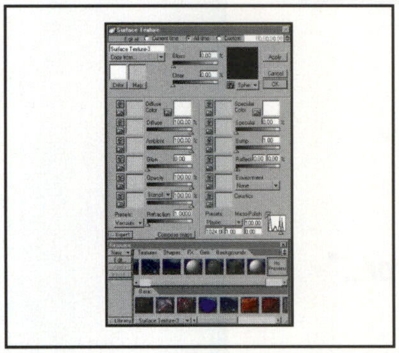


2 Select the Lathe tool. Click and drag the Z control point to define the radius of the lathe. You will want to create a full circle. Now click the Object Move Tool to create the lathed object. You will then need to rotate the lathed object so that it stands upright.

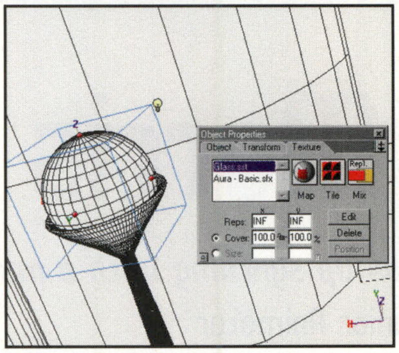


3 Position the pedestal next to one of the pillars and then move the orb into place above it. If you group these two objects together, you can once again make copies and place these in the other two positions in your scene.

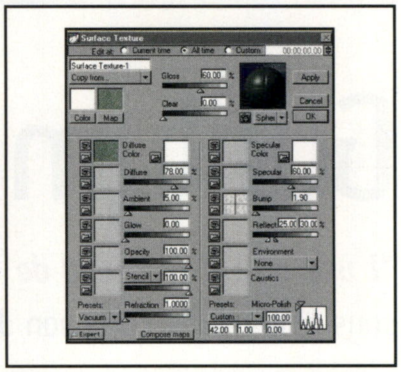
Part 6: Shady stuff You can modify a shader's position, repetition or UV mapping



1 *Strata 3D* lets you create your own shader surfaces by clicking on New under the Resource panel and selecting the type of shader you wish to create. Once you've selected this, you can define the Surface Properties of the shader and even enter Expert mode for more control.



2 Select a shader in the Resource panel then select an object and click Apply. To modify a shader's position, repetition or UV mapping, go to the Object Properties panel and click the Texture tab. You will find tools that give you complete control over the appearance of that object's surface.

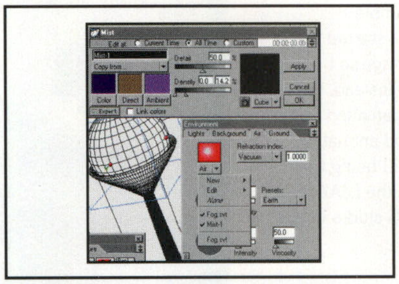


3 The included Glass shader can be used for the orbs. Tile shader is also handy as a basis for the Floor texture – simply replace the bump and map files. This is a good way to get a feel for how the shaders work.

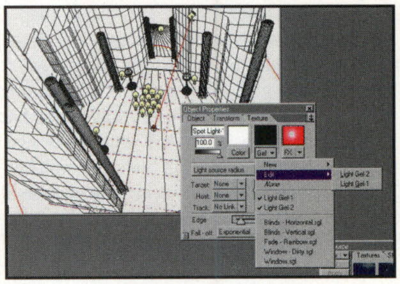
Part 7: Just for the fun of it Finish things off with some atmospheric effects

Strata 3D includes some really neat environment effects including fog and mist that can be applied to your scene as a whole (via the Environment panel) or specifically to an object for a localised effect.

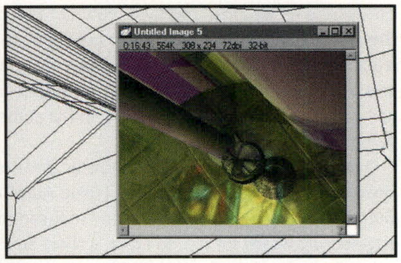
You can read about render options and the effect they have on your final output in the Online Manual provided by Strata Software. The manual is a good place to find out specific information about many of the other settings and tools as well.



1 Try applying two low-key effects to the scene just for the fun of it. A slight mist and fog combination creates an atmospheric effect. Mist – Density 0 per cent – 15 per cent, Fog – Density 12 per cent. Adjust these to fit your scene better.



2 Use a Spot light with a gel to create the stained glass effect on the floor. By selecting an image file to be used, you can create interesting effects. You can also view the scene from your Spot light in the same way as the camera object.



3 The scene we've created actually has quite a few processor-intensive qualities, especially if you add the fog and mist to your scene. Using the Render Window tool (camera icon) to test small portions of your render will save you time and helps avoid final rendering issues. ca•s

1

2

Gwilym Morris

"I use a still face and do the lip synching with a mirror..." says this year's European Junior Animator

Back in September, at the Imagination Gallery in London's West End, Gwilym Morris modestly took to the stage to collect his prize as the winner of the third annual European Junior Animators Award. Thanks to clips from his 3D animations *The Leaf*, *Money Trouble* and (the as-yet unfinished) *B-Movie*, Gwilym was able to walk away with a copy of *Softimage|XSI*, a Max Black workstation and a subscription to *Computer Arts*.

It was fitting that *Computer Arts* co-sponsored the awards, as the artist has been reading it since issue one, where he was inspired by a profile of Pixar. All these years on and that inspiration is coming to fruition. Not only has he won the EJAA competition and been profiled in this *Computer Arts Special*, but just over a year ago he landed a job in 3D at the games studio King of the Jungle.

"I studied engineering at Westminster University on Baker Street," he explains. "There I used AutoCAD on Sun Workstations using UNIX. Then I realised that engineering wasn't for me, so I took a short course in animation using *Inifini-D* on the Mac, and a short Dali course in *Photoshop* at St Martins."

The structural background from his degree helps with conceptualising things in 3D, according to Gwilym. Later, he saved up and bought *LightWave* and began creating animations such as *The Leaf*. This series of amusing shorts focuses on a leaf who faces various trials. In one, the leaf falls for a greenhouse plant and must avoid hungry snails to get water for his beloved flower.

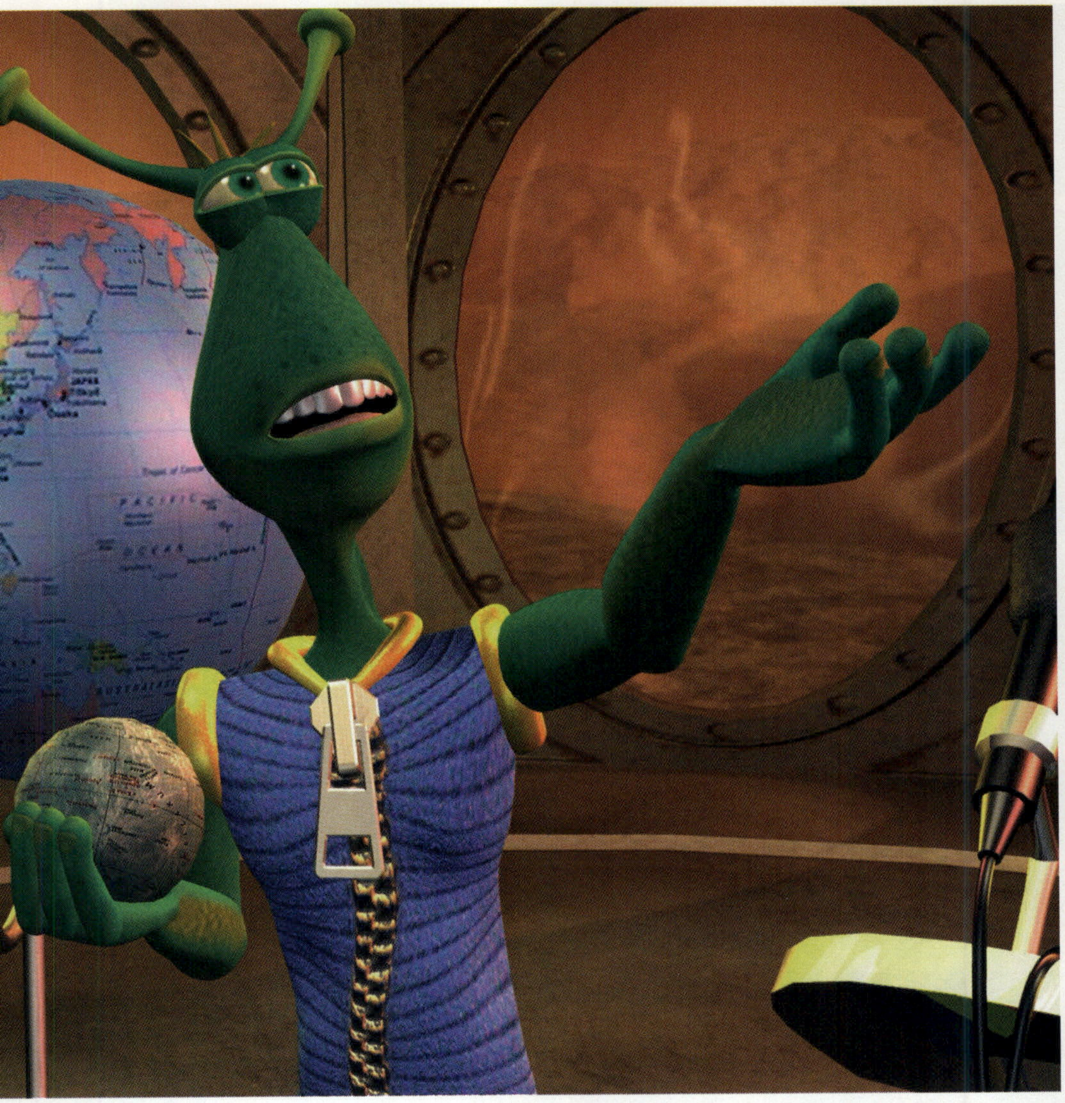
The animation that wowed the judges of the EJAA was a clip from Gwilym's current project, *B-Movie*, a talk piece in which an alien complains about Earth based on what he's seen in B-movies from our planet, but it started life as a very different project.

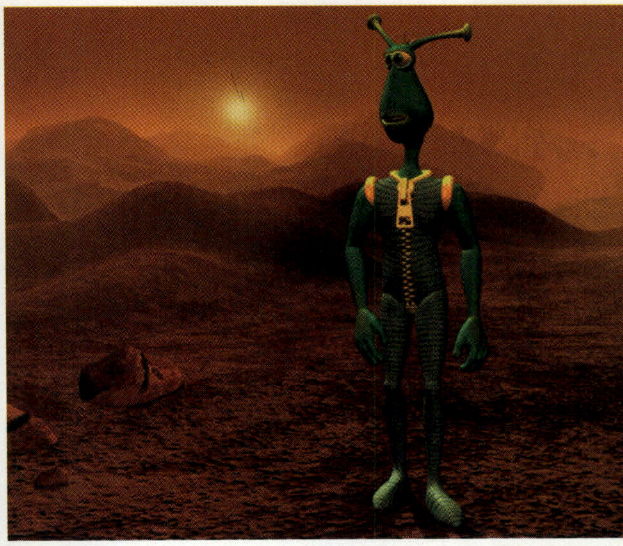
"I wanted to do a cook who was chasing a cockroach around. I wanted to keep it simple — just a couple of characters in a kitchen. I started doing the face but I'd just started using *Softimage* so I struggled with the character's features." Instead, the ambition for the piece was scaled back, an alien form being easier to work with. The design and animation work fabulously in the short, which is still being re-lit. When it's done, having already won him the EJAA, the next step could be a move to a major CG studio in the States. Don't bet against it. **ca>s**

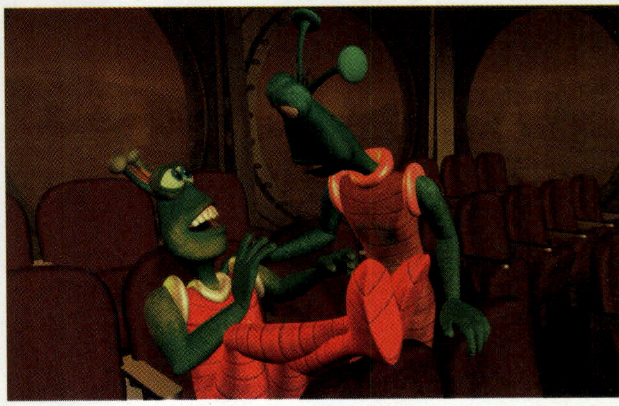
[e] gwilym@kingofthejungle.co.uk or visit **[w]** www.kingofthejungle.com. For EJAA 2001, email **[e]** sadie@bubblesqueak.co.uk.

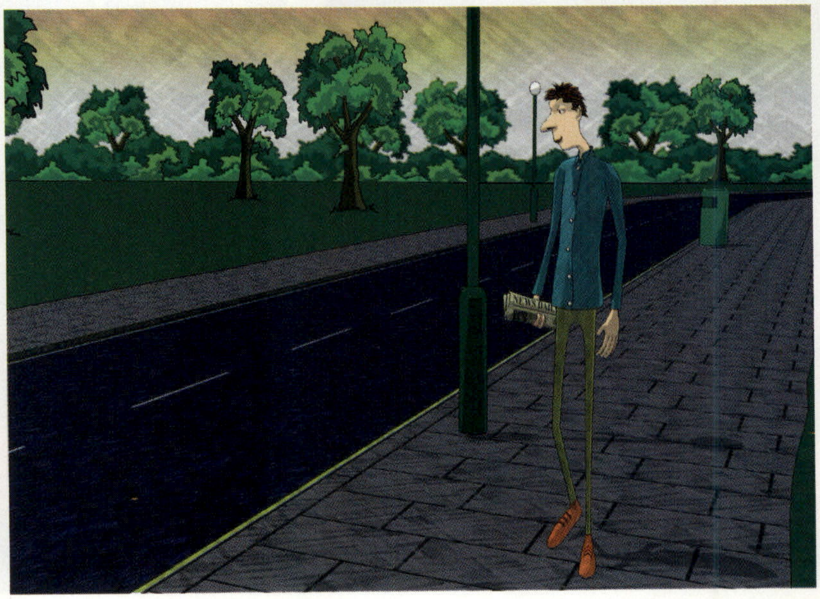
A clip from Gwilym's film *B-Movie* is on the CD. The final version will include different music, better lighting and more effects.

5









1. *The Leaf* is comprised of various stories involving this strolling green character. One of the challenges in *LightWave*, according to Gwilym, was to get the feet to interact naturally with the ground. The skating effect is hard to avoid.

2. While the colouring and costume design stand out in this still from *B-Movie*, the articulation in the hands and the handling of the lip synching are particularly eye-catching.

3. The first 3D application Gwilym used was *POVray*. Now he's producing animations like this using top-end tools such as *LightWave* and *Softimage*.

4. While for some new animators talking creates massive challenges, Gwilym sees it as a real blessing. "It helps with timing. I find it's sometimes more difficult when you don't have any speech for reference timing."

5. *Money Trouble* is tinged with black comedy and sees this young character attempting to retrieve a coin dropped in the road. Naturally the escapade turns out to be more trouble than it's worth.

6. The cartoon shading gives the piece a stylish, hand-drawn feel but this was really a contingency to keep rendering times down. At the time, Gwilym was using a 60MHz machine with just 32MB RAM.

Blender 2.4 – the basics

Advanced 3D modelling and animation plus a fully formed videogame engine – packages like *Blender* don't come along every day

Blender isn't the easiest program to get to grips with – traditional windows, and 3D conventions are abandoned in the interface, and there are many keyboard shortcuts to get to grips with. In addition, the Undo function is – rather strangely – omitted, so you have to get everything right first time.

That said, it's well worth learning the ropes. *Blender* includes some decent 3D modelling tools, excellent animation tools, and the ability to create complete 3D videogames without a single line of programming. You can create complex scenes, and render them at any resolution, and you can set up dynamics and behaviours very easily.

All this makes for a strong package with features you'd normally find in packages costing hundreds, or even thousands. Amazingly, however, *Blender* is freeware. Next year should see a boxed version for the price of a videogame, but the makers are committed to the idea that everyone should have access to professional level 3D tools.

Files on disc

You'll find these .blend tutorial files in the Blender folder on the cover CD along with a 30-day demo version of *Blender 2*. Expertise provided by Christian Darkin who can contacted at:**[e]** christian@darkin.demon.co.uk

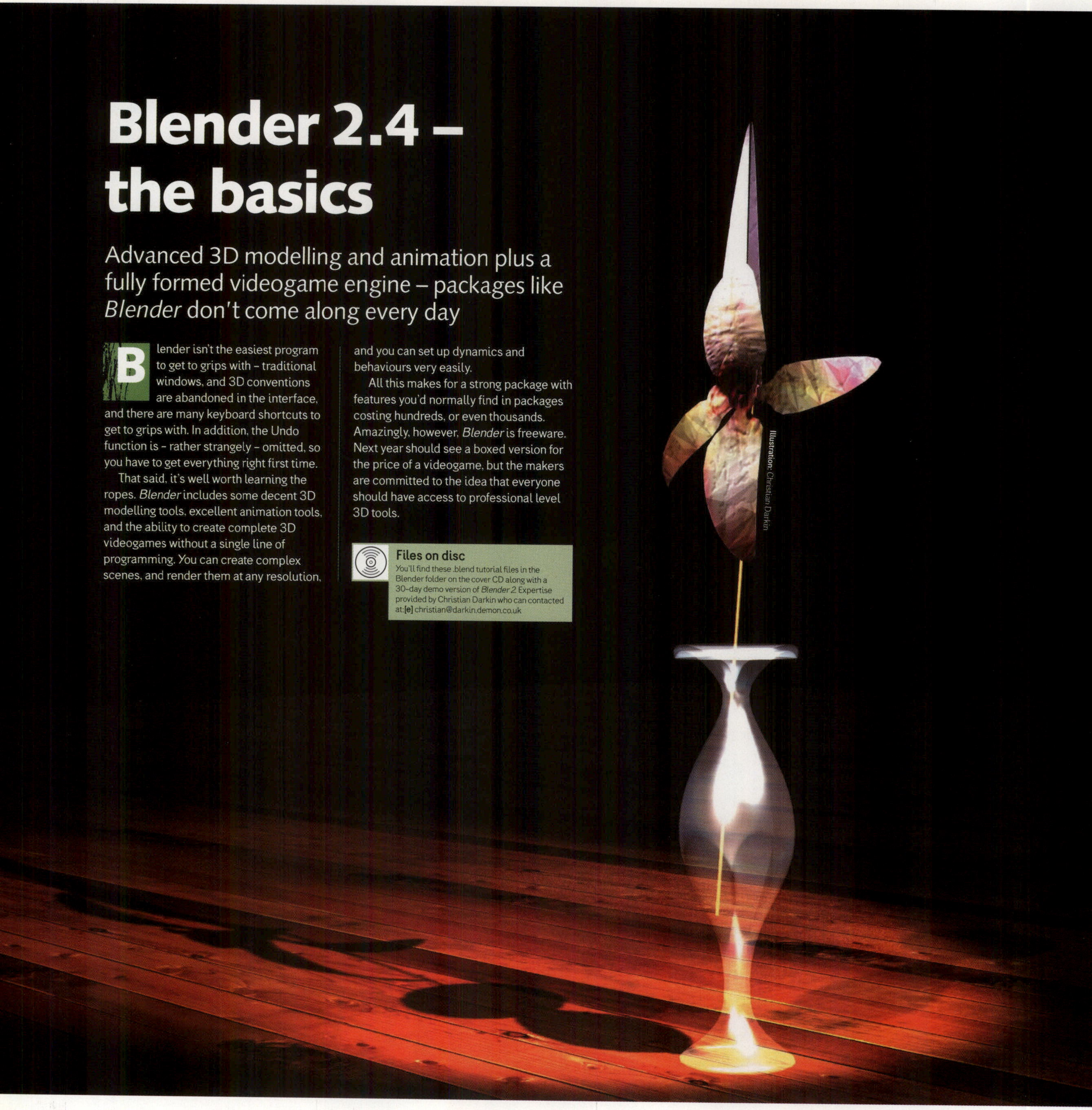


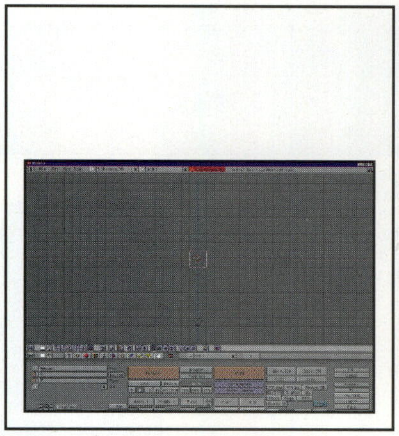
Illustration: Christian Darkin

Part 1: Basic blending

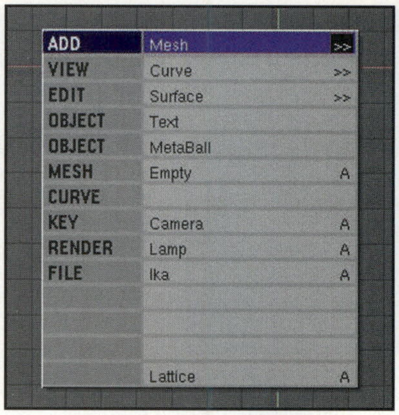
Blender is not the most friendly package when you first load it up. There's a lot of buttons, a lot of keyboard shortcuts, and no Undo function. Here, we're going to learn to build some flatpack furniture

Normals

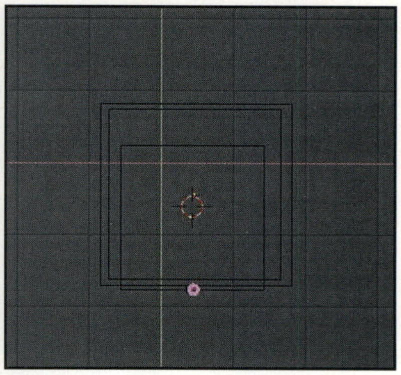
In order for collision detection to work, the normals of our box need to be flipped – in Edit mode, select all vertices, and hit Flip Normals in the Mesh editor.



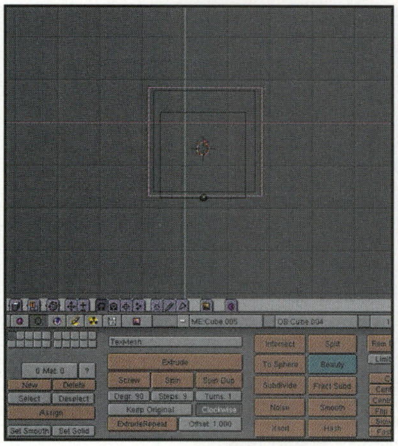
1 When you load *Blender*, you'll be presented with the main screen. The top half shows the work area where all the 3D work goes on. The bottom half lets you alter the various parameters for whichever object is selected.



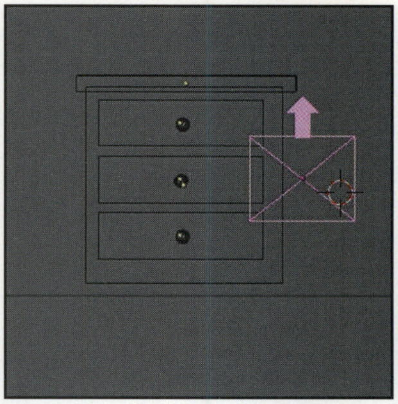
2 To see a menu, hit Space, or click the '?' icon at the top left of the screen. Now select Add, Mesh and Cube to create your first 3D object – a cube. The cube is automatically placed in Edit mode so you can manipulate its vertices by right-clicking to select, then hitting G and dragging them around.



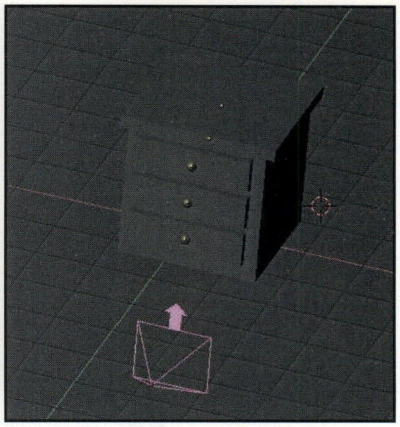
3 To move the whole object, you need to understand mouse gestures. Hit Tab to take the cube out of Edit mode. Now left-click and drag a short straight line with the mouse – this is a mouse gesture, which sets *Blender* into Drag mode. The next time you drag, your cube will move with the mouse. Add a few more shapes and move them around, and we've got a chest of drawers.



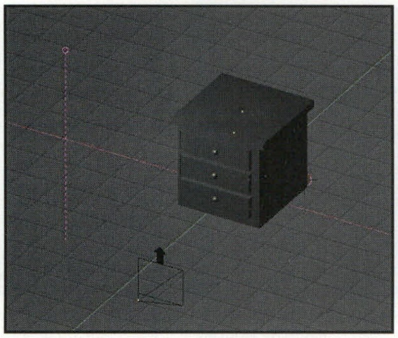
4 Now try a different gesture. Drag to describe an ark. Next time you drag, the selected object will rotate. You can also use the keys G – for grab and drag, R – for rotate, and S – for scale to manipulate an object.



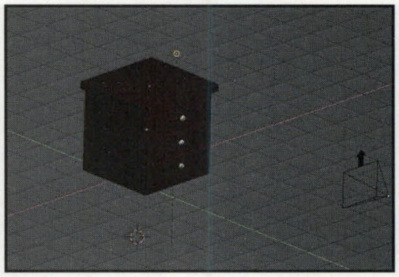
5 Right, now we are looking down on our model. We can change viewpoint very quickly and conveniently from the numerical keypad – 8 (up arrow) and 2 (down arrow) rotate the scene up and down, 4 and 6 rotate it left and right, and + and – zoom in and out. Hitting 0 takes you to the camera's viewpoint.



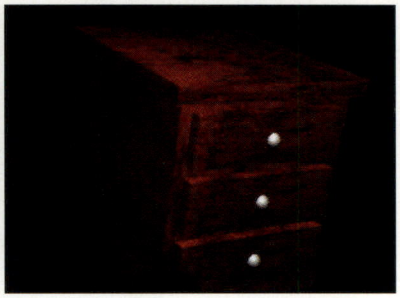
6 Alternatively, you can use ALT and drag to rotate the view interactively. The top row of icons below the View window also serve to alter various viewport settings. You can change the display to show Wireframe, Solid, or Shaded views, or alter the perspective.



7 Switching to a Shaded view, our object now appears black. This is because we have no lights. Hit Shift+A and add a light. This can be positioned to illuminate the object.



8 Now let's assign a material to our object. Right-click to select it, and click the Material editor (the red sphere) to bring up the Material controls. No material is shown, but when you click and hold the Browser icon (the "-" sign to the right of the second row of icons), you can add a new material to your cube object.



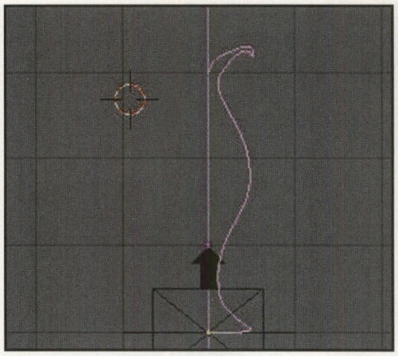
9 Now click the Textures button, add a new texture – the same way as we added a new material. Click image, and load a JPEG for the texture. Now click the Render button to bring up the Rendering controls, and click Render to draw out your finished image.

Part 2 : The flower

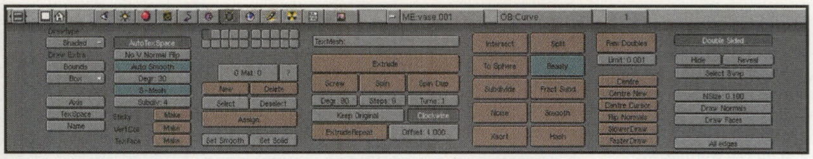
Now we've mastered the basics, let's try a couple more modelling techniques. To create the flower and vase, we'll be using some more advanced materials and lighting

Shadows

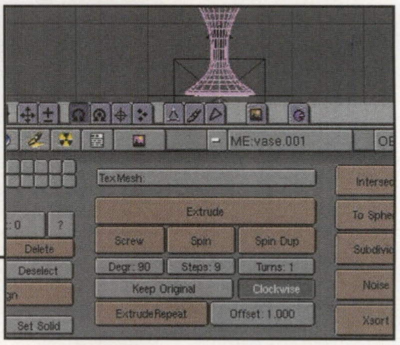
Spot lights are the only lights in *Blender* that can cast a shadow. These need to be angled to point at whatever object you want to illuminate.



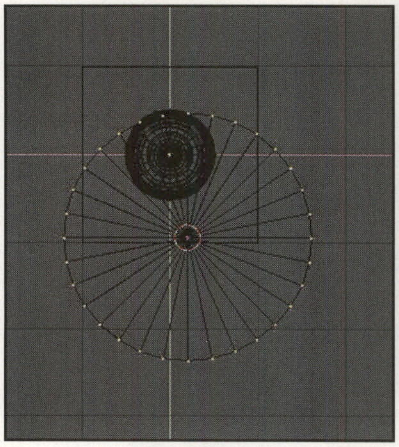
1 Create the vase. Add a Bézier curve and edit it to form half an outline of the vase. You can add extra points to the curve with CTRL-left click. When you're happy with the shape, we'll spin the curve to create our vase shape. Place the 3D cursor (left-click it) where you want the axis of rotation to be, and switch to the top view (hit 7). Spinning will take place perpendicular to the screen, so we need to be in a Top view to start with.



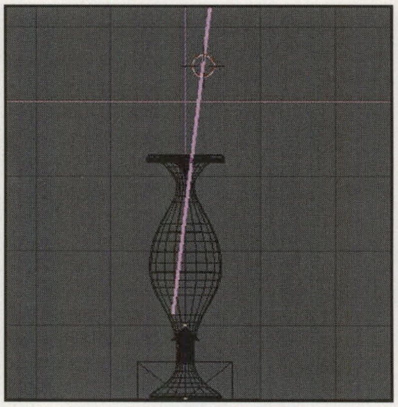
2 Get out of Edit mode with the Tab button, and turn the curve into a mesh by pressing ALT-C with the curve selected. Now, Tab again to go back into Edit mode, select all the points on the curve (hit B to draw a box to select them all at once). Click the Edit Buttons icon to bring up the Mesh Edit controls in the bottom window.



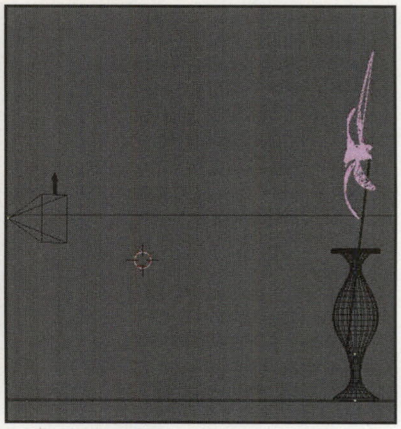
3 Finally, locate the Spin button in the centre, and adjust the controls below it so the Degrees button reads 360, and the Steps button reads 20. Now hit Spin and your vase will be created.



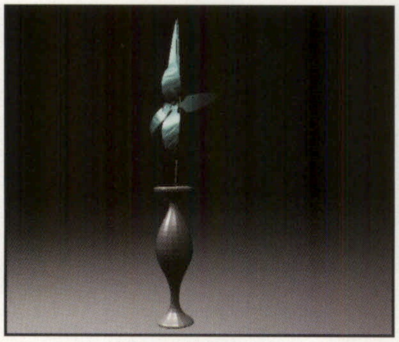
4 To create the flower stem, first draw a cylinder. Use the Add menu again to drop in the shape. It helps if you're in the Top view when you do this because the cylinder will always be created perpendicular to the screen.



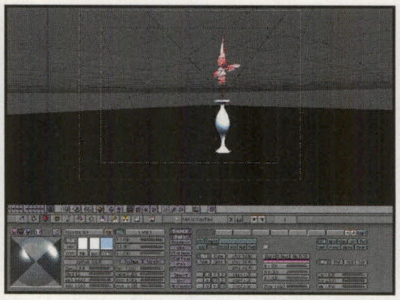
5 Right-click to select the shape, then switch to the Side view, and press S – for scale. Now when you drag, you'll change the size of the cylinder. For our stem, we need to scale it more vertically than horizontally. If you've got a three button mouse, use the middle button to scale only in one axis. If you haven't, use ALT-left button.



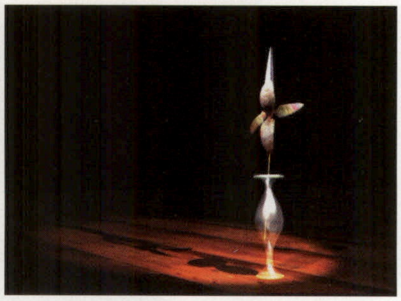
6 We could create our flower head in *Blender*, but to cover more ground, we're going to import it from a Max file saved in wrml format. Just go to load, and import the file 'flowerhead.wrl'. The flower will need scaling and rotating to position it on the stalk.



7 Add a couple of lights to give the scene some depth, and then click on the Render tab (the Picture icon on the second row) and click Render. This gives you an idea of the shot we've created.



8 To complete the image, we need to add some materials. The glass vase is created by reducing the alpha of the material and clicking the z/transp button. The wood making up the tabletop could have been done with a pre-set, but I prefer the look of an image map taken from a photograph.



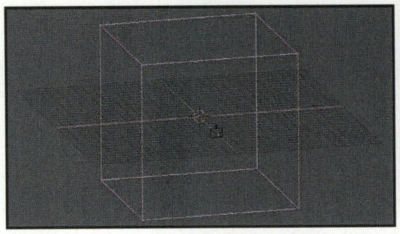
9 Finally, the flower itself is textured. An image made up of several flowers merged together was used to create the texture. Clicking on the Render tab brings up a series of buttons on which you can choose the various aspects of your render, and eventually save your handiwork to disc.

Part 3: Dynamics

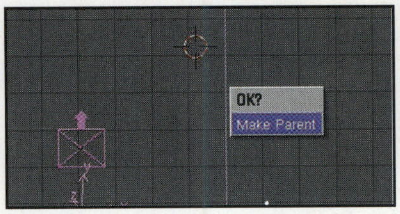
The new version of *Blender* now includes a complete videogame engine. It's possible to create an entire 3D videogame, or real-time simulation within *Blender* without writing a single line of programming

View points

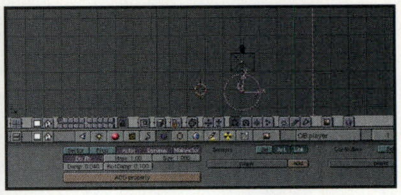
Hit zero on the keypad to get the view from your newly created camera. This is the view you want when you play the game.



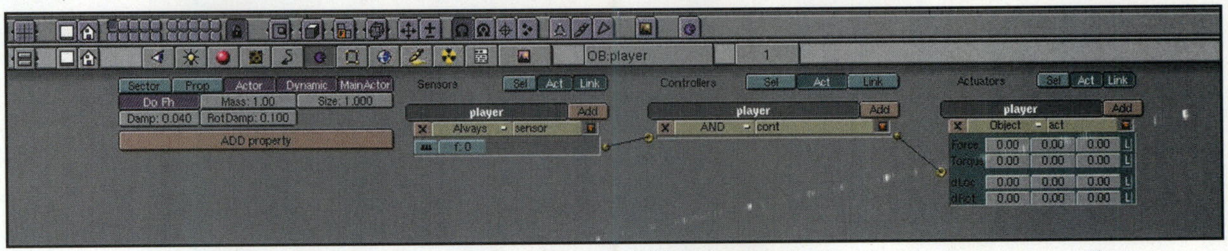
1 First create a sector. Sectors are the elements from which a game landscape is built. In this case, it's a single room. To build the mesh shape for the room (ours is a cube), we make it into a sector by selecting the Realtime tab, and clicking Sector.



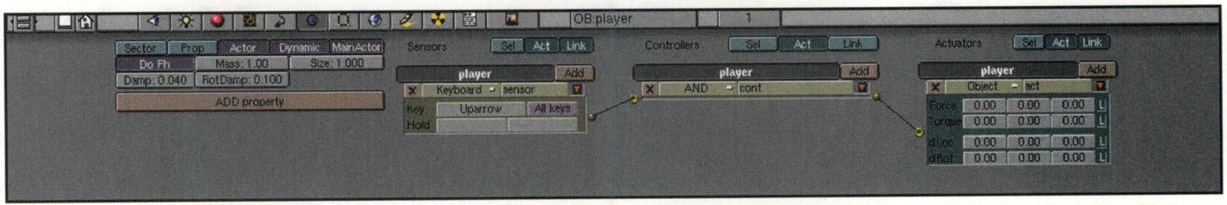
2 Next we have to build a player to interact with the scene. Create an Empty (an invisible object) somewhere in the room, and set up a camera next to it. Then with the camera selected, Shift+right-click to select the Empty. Now hit CTRL+P to make the camera the child of the Empty.



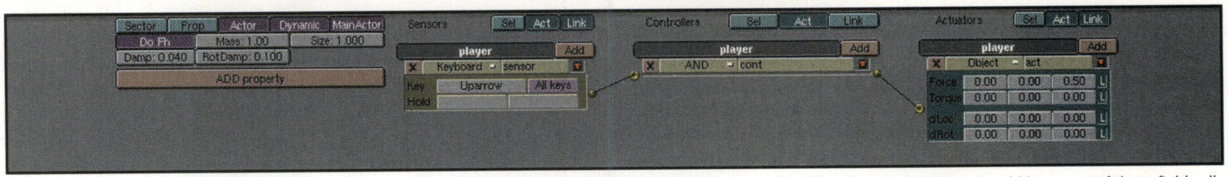
3 Now select the Empty, and go to the Realtime tab, then select Actor, Mainactor, and Dynamic. We now have a main actor (the player) which will interact dynamically with its surroundings (that is, respond to collisions, gravity and so on), and which has a camera attached to it to give us a first person perspective view.



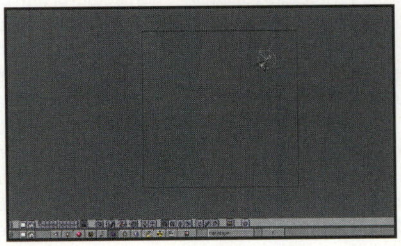
4 Now let's make that player move. In the Realtime menu with the player selected, click Add on each of the three items listed across the screen. This gives us three blocks – a Sensor, a Controller and an Actuator. Think of these as lego blocks which can be linked to give behaviour to objects in our game.



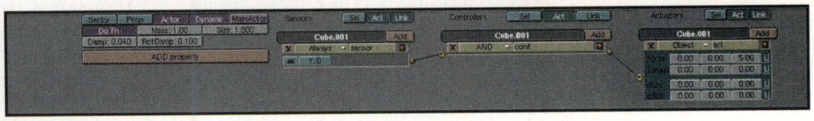
5 Drag the gold link at the right of the Sensor block to the link at the left of the Controller block, and connect the right of the Controller to the Actuator block. Now click on Always on the Sensor block, and select Keyboard instead. Click in the key field which appears and hit the up-arrow.



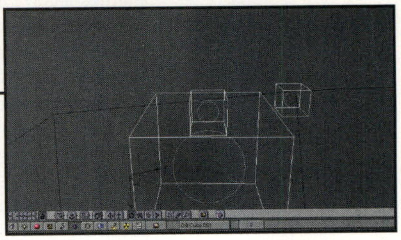
6 This gives us a sensor that reacts to the up-arrow being pressed. Now go to the Actuator block, and find the Force item. There should be a row of three fields all set at 0.00. These represent movement in the X, Y and Z axes. Set the last figure to 0.5.



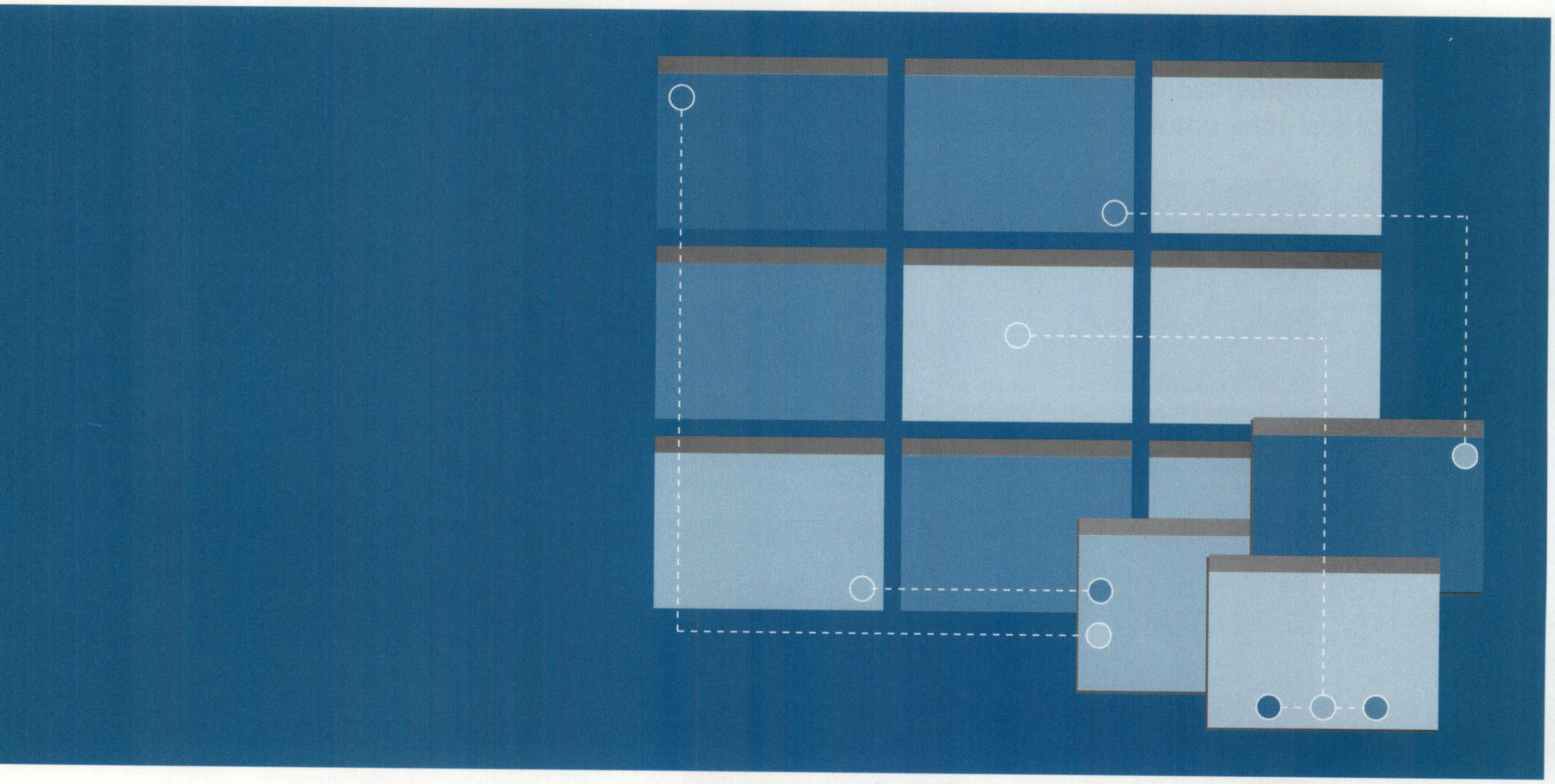
7 Check it out. Hit P with the cursor in the View window, and you'll see that when you hit the up-arrow, your player moves. Hit Space to return to Editing mode. Next we want to add some more keyboard events. This time set up the left and right arrows to control the torque (angle of rotation) of your player.



8 Now add another object – make it a simple small cube. Put it somewhere out of the way. Set it as an actor, and give it a series of linked blocks in the Realtime window. This time leave the sensor as Always, and set the actuator to 5 in the z -axis.



9 This object will be a bullet. Select the player (Empty) and set-up another set of bricks. Make a keyboard sensor for the CTRL key, and set the actuator to Add Object. Now type in the bullet's name (Cube.001, probably – it's case sensitive), and set a time for the bullet to live to 50. Now play the game, and you'll find you can fire in all directions. ca•s



Create 3D for the Web

3D on the Web has never been more accessible or easy to produce. We check out some of the programs and packages that may change your two-dimensional view of the Web forever...

3D for the Web has come of age. Whether it be for complex e-commerce showcases or interfaces and navigation devices that add a little perspective, the design and creation of 3D graphics for use on personal and company home pages is indeed becoming a much easier task.

One problem that does face those creating and publishing 3D content for the Web though, is that of bandwidth limitation. Virtually any modern 3D app is capable of some stunning and detailed results, but rendered file sizes are impractical for Internet delivery, let alone interactivity.

And interactivity is important, proved not only by the fact that more visitors are craving a more dynamic Web experience (think of a little known software package called *Flash*!), but also on a commercial level, with companies wanting visitors to rotate and view a product from every possible angle.

This method of showcasing products is becoming more widespread, and although there's no guarantee that interactive three-dimensional views will persuade visitors to a commercial site to buy a product, it's certainly a more enticing prospect than a grainy JPEG.

Product visualisation isn't the only good use for 3D content on the Web. Education is another more than feasible use. 'Virtual exhibits', which lead the viewer through an interactive gallery of antiques or treasures is also a practical use of the various technologies involved.

Macromedia *Flash* has long been the supreme champion of the Web 2D animation world, but the plethora of superb 2D interactivity and animation currently gracing our browsers isn't proving to be enough – many designers and animators are desperate to convey 3D artwork and animations.

And, due to this demand, and the nature of the *Shockwave Flash* file format (small in size) and the widely accessible *Flash Player*, it is no wonder that software companies such as Electric Rain **[w]** www.erain.com (in the form of *Swift3D*) have found a viable solution to the once painful method of tracing rendered 3D animations to produce *Flash* animations and the like.

But, even though 3D technology has advanced to the point where it's possible to create rendered imagery and animations worthy of being broadcast through the medium of film or television, producing bandwidth-friendly content for the Web is a different ball game.

Luckily, help is at hand. Creating 3D Web content is easy thanks to various plug-ins and utilities such as *Metastream*, *Cult3D* and *Swift3D*, packages such as *3D Studio MAX*, *Strata 3D* and *Cinema 4D* – apps built and designed for the purpose of outputting detailed rendered images and animations.

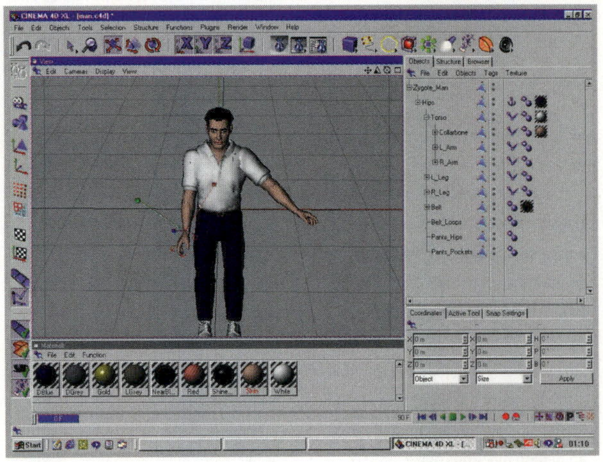
In order to give you a sporting chance of implementing 3D content in your site, we'll guide you through the process of using a few of these utilities with some of the most popular 3D applications around.

Metastream and *Cinema 4D XL 6*

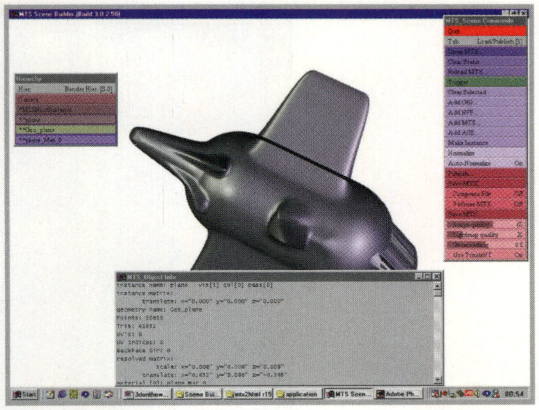
Now in its third incarnation, *Metastream MTS3*, can claim to be one of the most sophisticated 3D Web technologies around, with support for such features as eflections and Procedural textures.

In fact, MetaCreations has placed such importance on 3D on the Web, that the company has sold all its other graphics software (*Bryce*, *Poser*, *Painter*, *Carrara* and *Canoma*) to companies such as Corel and Adobe in order to concentrate on the technology. Designed to be the most versatile 3D Web technology of the lot – with huge scope for educational, commercial and personal sites, *Metastream* will work with most 3D applications as long as they are able to export MTS (Native *Metastream* files) OBJ (*Alias/Wavefront*) NFF 3D files or ASCII files among others (which most, if not all 3D apps currently support!).

Cinema 4D XL 6 is one of the apps that can export to OBJ file format. It's the perfect starting block for 3D content creation because of its popularity and affordability.



Applications such as Maxon's *Cinema 4D XL 6* **are great for producing the intial models for your 3D content. Export the file and open it in one of the 3D builder apps.**



The ***Metastream Scene Builder*** **in action. It really is a simple process to create content – just import your work from your favourite 3D app, add a little interactivity and export. It couldn't be easier.**

The first part of the process is to create the geometry, textures, lights and everything else you want to be included in the scene. The next step is to export as an OBJ file. This is, as they say, where the fun starts.

Head off to **[w]** www.metastream.com and download the *MTS3 Scene Builder*. A free utility, the *MTS3 Scene Builder* enables you to create, add and modify various objects within your scene and add interactivity. There are many ways to create *Metastream* content and the *Scene Builder* acts as the universal translator whether you're using *Cinema 4D* or *Photoshop*.

Once you're happy with the result, the scene is saved as an MTX file. The .mtx file format contains all of the geometry, textures and so on, and also the animation and interaction commands. This is the XML portion of the MTS3 file format and enables any attribute of the scene to be controlled with XML. Because XML is a text-based language, any text-editor can be used. Luckily, an MTSE XML Authoring Guide featuring a complete list of attributes and their XML tags is also available for download from Metastream.

But, before we get all excited, it must be noted that you do need a licence to broadcast *Metastream* content. Fear not though, because this licence is free for non-commercial use. Simply go to the following URL to apply for your key: **[w]** www.metastream.com/developer central/broadcastkey/getkey.html The bad news is, you'll have to wait a few days to get it through.

Once you have your key, there's nothing to stop you embedding 3D as and when you please. Once again, you'll need an MTX to HTML download tool, available from the developer section of **[w]** www.metastream.com. The mtx2html conversion utility is a quick and easy way to publish and embed *Metastream* content into an HTML page.

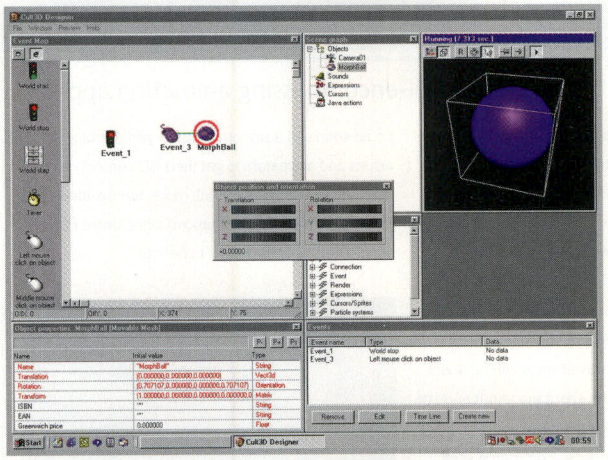
Cult3D and *Strata 3D*

Cyclore's *Cult3D* has built a strong reputation as a reliable means of producing 3D content for the Web. Residing on version 5 and currently supporting Windows, Mac OS and NT, the Active X component technology present in *Cult3D* interactive graphics can be implemented into Websites, as well as *PowerPoint* presentations and *Acrobat* PDF files.

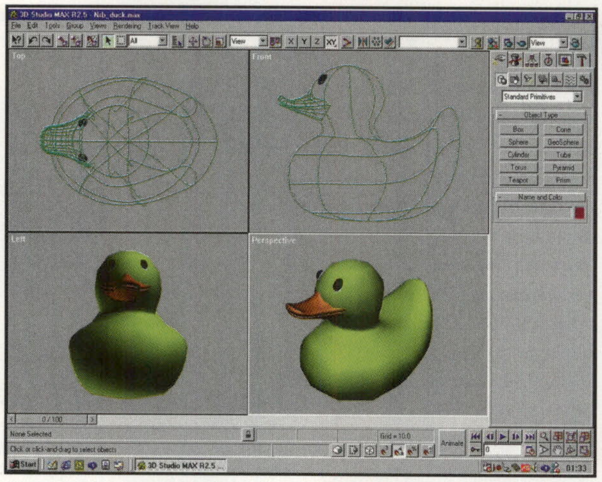
Strata 3D is an excellent app for creating 3D models, with a large toolset considering the app is free, (you'll find a demo version on the CD). *Strata 3D* will very handily (for our purposes anyway) saves files out as *Cult3D Designer* files. The process of creating and embedding *Cult3D* objects into sites involves similar techniques to the ones used to produce *Metastream* content. Objects can be modelled in many applications (or at least those supporting the DXF file format) but *Strata* seems a good choice as it can save out directly as .c3d files (*Cult3D Designer* file format).

Once geometry, textures and lighting have been created to perfection, just load the whole thing into the *Cult3D Designer* application.

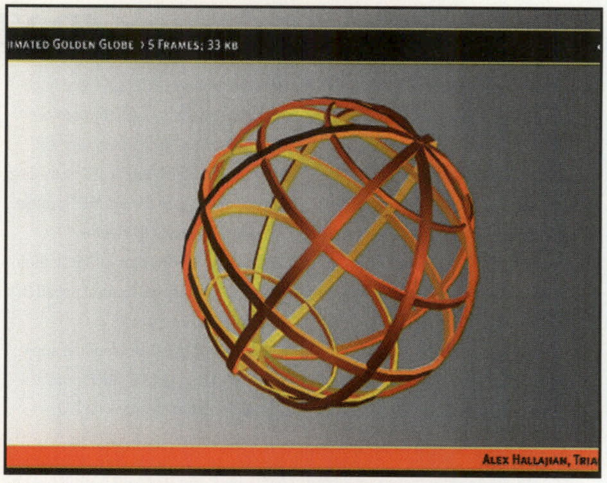
This is a free download available from **[w]** www.cult3d.com and is the all-important device in creating *Cult3D* content. As with the *Metastream MTS3 Scene Builder* application, the *Cult3D Designer* enables you to add interactivity and animation with the minimum amount of programming knowledge (although *Cult3D* can be controlled through Java if need be). After tweaking everything within this intuitive app, you can save all the data out in *Cult3D* format ready for presenting within a site. Simply download the *Cult3D* viewer for your browser (also available from **[w]** www.cult3d.com) and open up the saved file. Save it as an HTML file, place it within your site and voilà, three-dimensional content for the Web in minutes.



Cult3D Designer **is a great way to add interactivity to your 3D content. It's also free to download. Check out [w] www.cult3d.com**



3D Studio MAX and *Swift3D* make for an awesome combination. Build, mould and sculpt in *MAX*, export it into *Swift3D*, export again and you have a *Flash* movie!



ElectricRain's *Swift3D* is a great utility for converting *3D Studio MAX* scenes into *Shockwave Flash* movies. It may not be 'true 3D' but it certainly has plenty to offer.

Swift3D and *3D Studio MAX*

Swift3D by ElectricRain is a standalone application designed for importing models and animations from various 3D applications and saving them out as *Flash* SWF files. This is a major breakthrough within Web 3D technology, offering a simple, yet stunning solution to those struggling to create faux-3D *Flash* movies. And, what better application to complement this package than the all-conquering, all-encompassing *3D Studio MAX*.

The processes involved in the creation of bandwidth-friendly 3D within *Swift3D* are different to the two methods previously discussed. The great thing about this application is that virtually everyone who comes into contact with the finalised content has the plug-in needed to view it.

This is a great boon for all 3D artists and animators wanting to showcase their work on the Web. After all, who wants to spend hours creating content that can only seen by a select few? Incredibly low file sizes are also a bonus for any impatient visitor!

The actual techniques involved in transforming your 3D models and animations to *Flash* SWF files are much simpler than you might think. On importing a 3DS file, *Swift3D* will recognise and retain all colours, camera views, lighting schemes and animations.

What's more if you just have a model to import, *Swift3D*'s drag-and-drop animation functions make simple animations a breeze. Just open up the 3DS file in *Swift3D*, add any necessary animation and hit Export.

The whole lot is rendered as a SWF. The convenient thing is that if you have *Flash*, you can easily import the movie, adding other elements and advanced interactivity (depending on your knowledge of ActionScript).

Just like any self-respecting 3D graphics app, the import of EPS files is also supported, ready for creating 3D geometry, all from within *Swift3D*.

This adds up to what could be the most compelling Web 3D solution there is: the technology behind *Swift3D* is backed up by the most popular technology on the Web, Macromedia *Flash*.

However, the major problem with applications such as *Swift3D*, is that that when interaction is added, the graphics are taken back into a 2D application – *Flash* – so you're not really creating true 3D.

But, in a world obsessed with bringing new technologies to the masses, it is surely only a matter of time before true 3D is possible on a large scale, just as 2D interactive animation is today.

Flash – in the third-dimension

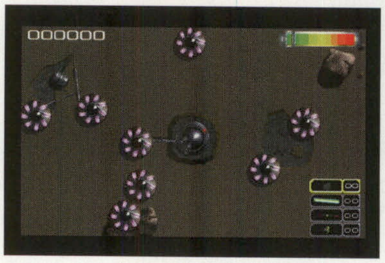
Macromedia's 3D plans for the all-encompassing animation app

At SIGGRAPH 2000 (held on 25 July 2000) Macromedia had a few interesting announcements to make concerning the future of its *Shockwave Flash* technology.

The company announced that it would be teaming up with Intel to bring Intel's Internet technology to the Macromedia *Shockwave Player*.

The combination of Intel's *3D Graphics* technology and the *Shockwave Player* will no doubt inspire more people to think about the application of 3D on the Web and enable more companies to produce Shockwave-powered e-commerce sites.

The technology that Intel boasts features the ability to display smooth, photo-realistic surfaces, cartoon rendering and such dynamic effects as smoke, water, fire and vapour. What's more, *Alias*, *Discreet* and *Softimage* all support this move, so we could soon see a smooth route for professional artists and animators to get their 3D content on the Web. We've yet to hear much more, but the Intel's *Internet 3D Graphics*-enhanced *Shockwave Player* should certainly be a sight to behold.



Interactive games and graphics will no longer be restricted to 2D with Intel's *Internet 3D Graphics*-enhanced *Shockwave Player*.

3D Tools and Utilities

Metastream

Website: www.metastream.com

Potentially the Web's most advanced 3D technology, this software is fast becoming one of the standards for embedding 3D content within a site.

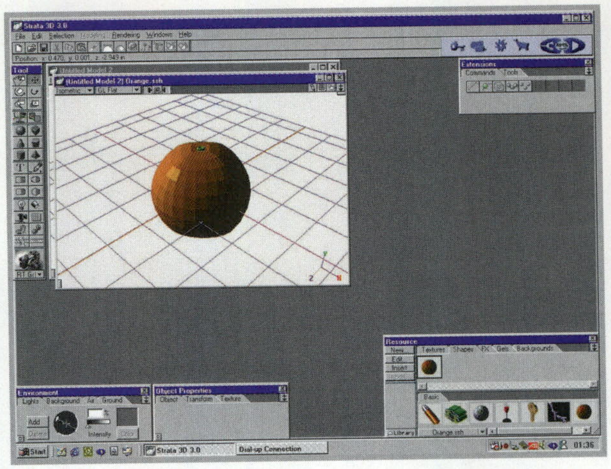
The third release, *MTS3* brings support for Procedural textures, reflections and much more. The *MTS3 Scene Builder* is a quick and easy way to create *Metastream* content. The software and authoring guide can be downloaded from the Website.

Cult3D

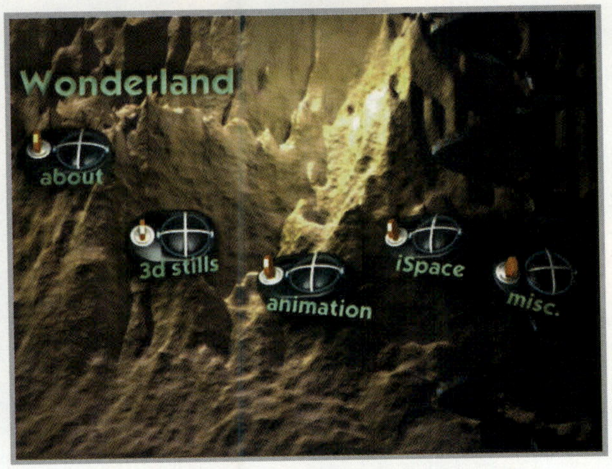
Website: www.cult3d.com

Quickly establishing itself as a real contender for the three-dimensional showcasing of commercial products, the *Cult3D* community on the Web continues to grow.

The *Cult3D Designer* application is an intuitive program enabling the creation and export of files ready for presentation. As with *Metastream*, your browser will need a separate plug-in, but results are often worth the effort.



Strata 3D is a free 3D application, but that's not to say it can't produce some quality results. It is even possible to save directly out in the *Cult3D Designer* file format.



iSpace is Caligari Corporation's answer to the world of Web 3D. Create Web pages by constructing 3D models – the 3D content is then rendered as 2D pages. Novel.

Swift3D

Website: www.swift3d.com

At only $139, *Swift3D* is a real bargain. Enabling the quick and painless transformation of *3D Studio MAX* files into SWF files, this app really could hold the key to your 3D success on the Web. Doesn't have the 'true 3D' appeal of such utilities as *Metastream*, but a full modelling and animation toolset completes a great package. Head to the above URL now for a demonstration.

Vecta3D

Website: www.vecta3d.com

In much the same vein as *Swift3D*, *Vecta3D* transforms complex 3D models into vectors at the click of a button. As with *Swift3D*, this can be outputted as an SWF ready for implanting into an HTML page or editing in *Flash* – the choice is yours.

Nike utilises *Metastream* to the full with products demonstrated in real-time 3D. You may never look at a trainer on the Web in the same way again.

Illustrate!

Website: www.davidgould.com

Illustrate! is another top class plug-in for *3D Studio MAX* that enables you to render out your images in a non-photo-realistic manner. This application also exports frames as SWF animations, so adding interactivity should only be a matter of touching up on your *Flash* ActionScript.

iSpace

Website: www.caligari.com

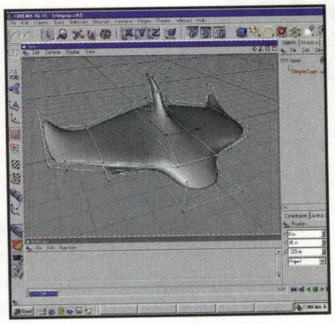
iSpace is one of those applications that you either love or hate. A quirky number, from the makers of *trueSpace*, *iSpace* is best described as a tool for creating '3D Web pages'. Pages are designed as 3D models and rendered as 2D pages.

The results aren't 'true 3D' as such, but *iSpace* can produce some excellent results. **ca•s**

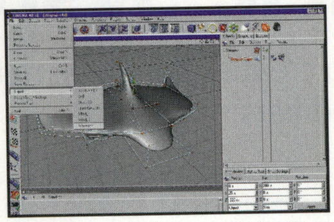
Cycore's *Cult3D* in action. This camera can be interacted with in many ways: click the lens and it will retract, roll your mouse and the whole camera will rotate.

3D content in minutes

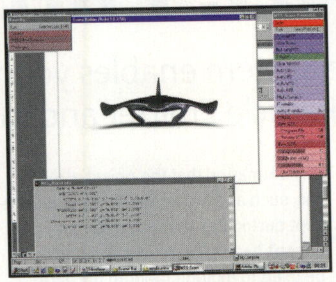
Metastream and *Cinema 4D* – the easy way...



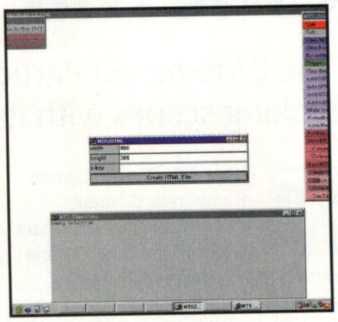
1 Open up *Cinema 4D XL 6* and create a simple model. Here, for clarity's sake, we've used one of the models supplied with the app – a Stingray. We don't need to change this model at all, so it's straight to the File menu.



2 Export the model as an OBJ file. This is completed by going to File>Export and selecting Wavefront. Save the file in a place you'll remember. Next, download the *MTS3 Scene Builder* and *mts32html* utility from **[w]** www.metastream.com. In order to actually publish your content you'll need a broadcast key. This is freely available from the company's Website – but be prepared for a few days' wait until your key arrives.



3 Open up the *Scene Builder* and choose Add OBJ from the menu on the left of the screen. Your model should appear. In the *Scene Builder* there are various options for adding interactivity. We just want a simple 3D object on the Web, so click Publish. Save the MTX file in a convenient place.



4 Next, open up the *mts2html* utility you downloaded earlier. Enter the preferred size and your broadcast key, click Create HTML and save the resulting file. Open it up in your browser and hey presto! *Metastream* content.

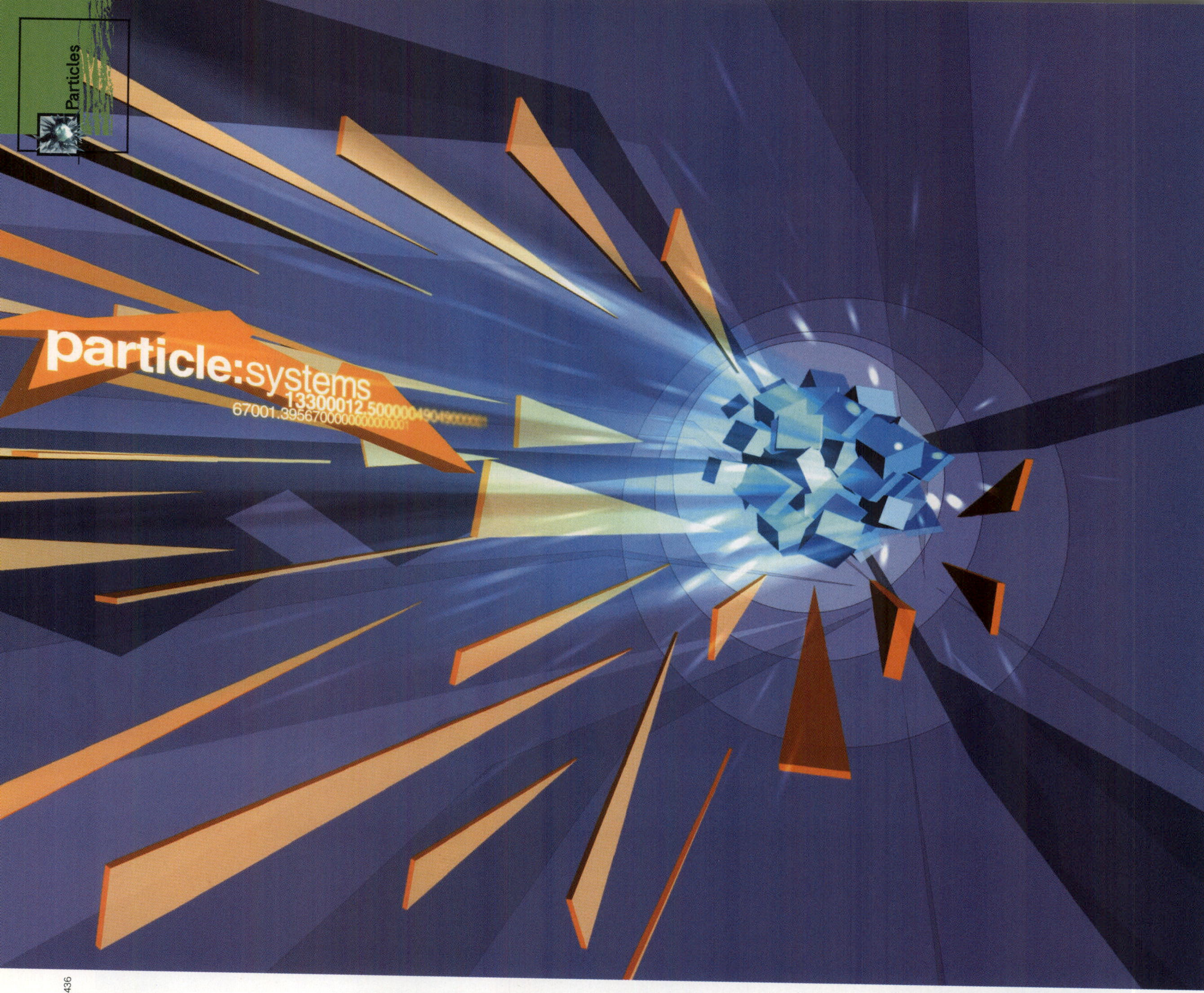


Illustration: Rob Brearley. **Telephone:** 020 8883 5436

Cinema 4D: Particle System

The *Cinema 4D* Particle System enables you to create impressive natural looking scenes with its Particle Emitter and modifiers

Cinema 4D's Particle System includes nine different functions, the most important of which is the Base Particle Emitter. This can be used to create a variable particle stream which you can allocate to any objects already created.

With a simple drag-and-drop operation, you can turn a single ball into a stream of particles, that once rendered will take the shape of your object. The Particle Emitter can be used in animation to create shoals of fish. Any animation that the object already has, such as a swimming motion, will be kept during the animation so this doesn't have to be re-done. It can even be used to include random particle objects, so you can create particle animated scenes with object variety.

This particle stream can be varied through the dialog window which can be used to adjust most of its parameters. Further to this are a selection of modifiers which will change the movement of the particle stream. These consist of: the Attractor, which is a gravitational force. The values can be positive or negative and, as the name suggests, you can use it to attract other objects.

Gravity is simply that and will simulate the gravitational force of the earth. The Deflector can be used to deflect water off an umbrella to give the effect of rain bouncing off canvas. Friction can reduce the speed of the particles, and could be used to simulate a ball rolling to a stop. Rotation rotates the particle stream. Turbulence is perfect for smoke as it creates a swirling effect with the particle stream. The Destroyer removes particles from the stream. Finally, Wind appears as a fan in a box this can be used to blow the particles in any determined direction.

Tutorial files

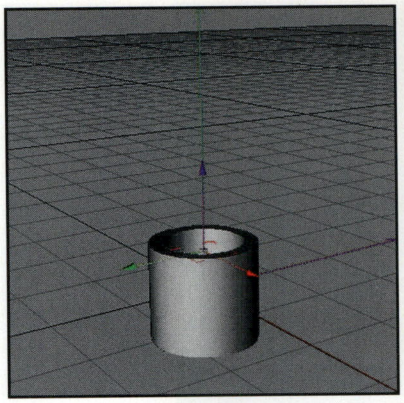
You'll find the files you need for this tutorial in a folder on the cover CD called **dual/tutorial/particles**. There's also a demo version of *Cinema 4D XL 6.1* in the **macsoft** and **pcsoft/featured** folders.

Part 1: The Particle Emitter

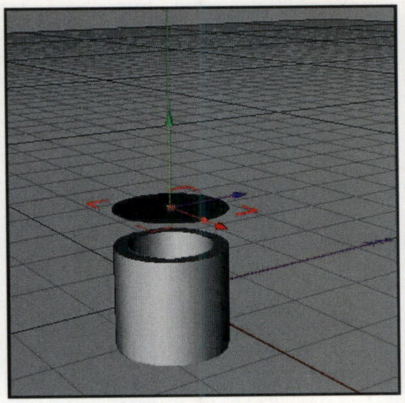
We'll start with simple animation using the Particle Emitter and Rotation modifier. First, create a 'top hat' Boolean object – a blue time marker shows the particles in action

Creating materials

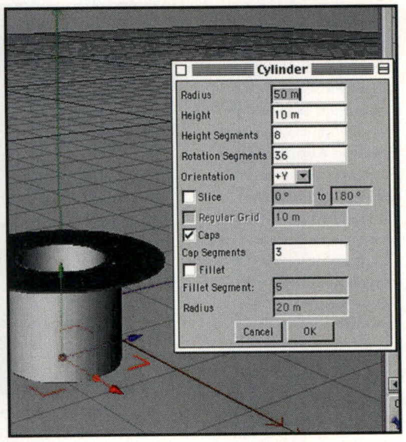
Near the bottom of your screen you'll see the Materials dialog box. Select New to create a material and then double-click the ball that appears. The Material box will appear here and you can adjust the colour, transparency and import your own images from *Photoshop* to use in projects. If importing your textures make sure they are as small as possible to avoid greatly increasing render time. Once you have decided on your texture, click Refresh. If all looks fine, then close the Materials window. Your new material will appear in the dialog box at the bottom of the screen. To use this simply drag-and-drop on to the object you want.



1 Start by creating a tubed object with an inner radius of 50m, and a height of 200m. This will form the main part of your 'top hat'. To change the parameters, double-click on the tube picture on the right of the screen.



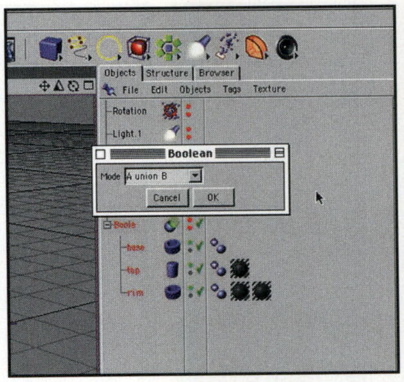
2 Create a cyclindrical object to act as the top of the hat. Adjust the parameters to a radius of 50m and a height of ten. Select the Directional Movement tool at the top of the screen to move this into position.



Cylinder

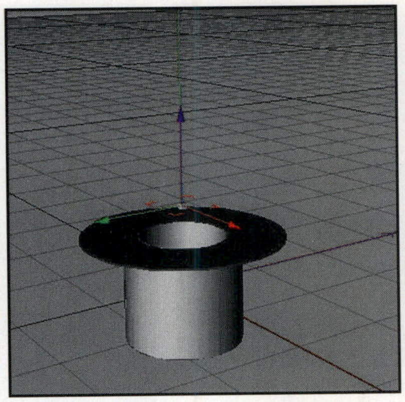
Radius: 50 m
Height: 10 m
Height Segments: 8
Rotation Segments: 36
Orientation: +Y
☐ Slice: 0° to 180°
☐ Regular Grid: 10 m
☑ Caps
Cap Segments: 3
☐ Fillet
Fillet Segment: 5
Radius: 20 m

3 To finish the hat create another tube with an inner radius of 90m, an outer radius of 200m and a height of 40m. Move this object into place.

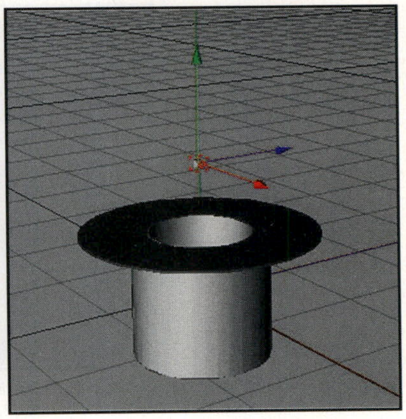


Mode: A union B

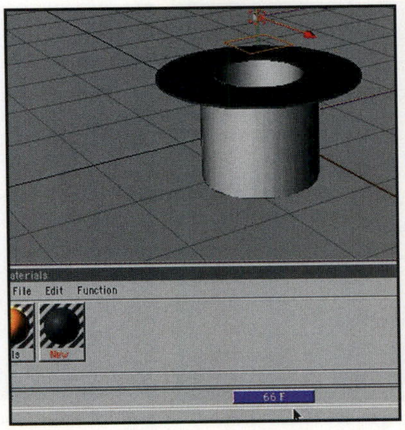
4 The final stage of the hat's creation is to make these three objects into one. The easiest way to do this is to create a Boolean object. To do this select Boolean and then double-click on the icon on the right. Choose A Union B. Next drop all the objects into this Boolean and rename it 'hat'.



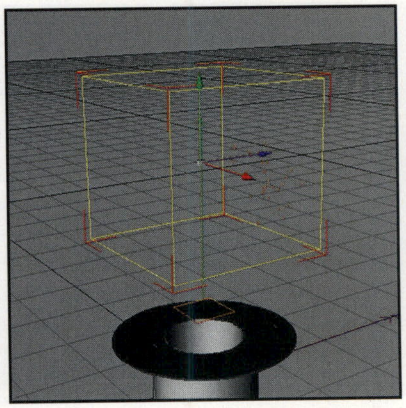
5 Select the Particle Emitter from the Particle System icon at the top of the screen. You will see a square appear in your hat. Simply rotate and scale it to the size of the hat's inner radius, then move it to a position just below the hat's rim.



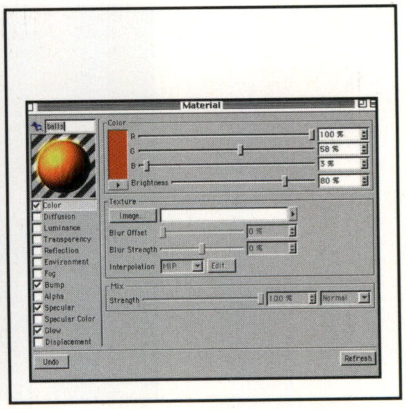
6 Create a simple sphere and scale it down to a radius of about 60m – this will be the particle object. Drag this on to the Particle Emitter. Double-click on the Emitter icon and set the values.



7 By running the blue time marker at the bottom of the screen you can see the movement of the particles. They should all shoot up from within the hat into the air.



8 To create a more natural movement of the particles, create a Rotation modifier, which will appear as a box. Move this just above the hat, and check that it is central in the other views. You should now see the particles rotate as they rise.



Material

Name: balls

Color
R: 100 %
G: 58 %
B: 3 %
Brightness: 80 %

☑ Color
☐ Diffusion
☐ Luminance
☐ Transparency
☐ Reflection
☐ Environment
☐ Fog
☑ Bump
☐ Alpha
☑ Specular
☐ Specular Color
☑ Glow
☐ Displacement

Texture
Blur Offset: 0 %
Blur Strength: 0 %
Interpolation: MIP

Mix
Strength: 100 %, Normal

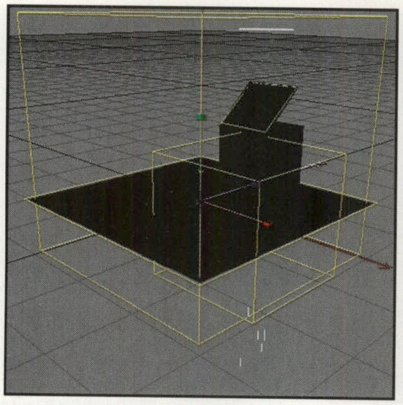
9 Finish off by applying Materials, Lights to the scene. Push the render button to check out a still of the animation will look. To see the final result, open the file hat.c4d in 'dual/tutorial/particle' from the CD-ROM.

Part 2: Particle System modifiers

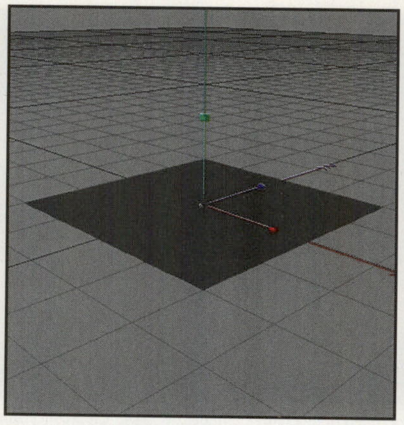
How to use deflectors and modifiers to change the direction and behaviour of your particles so that they act as natural reacting elements

Lighting

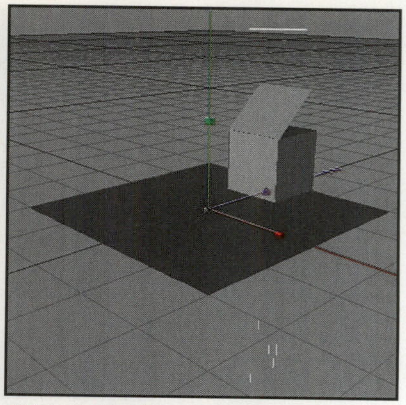
In this tutorial we have attached lights to particles for effect, but they can also be used as static objects. To create a light, click the Light icon at the top of the screen. A light will instantly appear on your stage which you can move into position. Its usually a good idea to render the scene to see what effect the light has. To adjust the colour and brightness, double-click on the light in the right-hand Objects box which will give you access to all light adjustment.



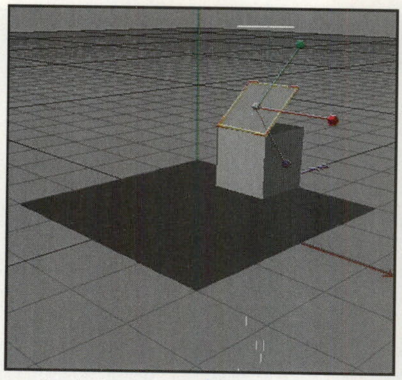
1 Were going to create a scene that uses a selection of Particle modifiers to change the direction and behaviour of our particles. The principles of this can be used to create natural rain or tip over a box of marbles. Create a new project.



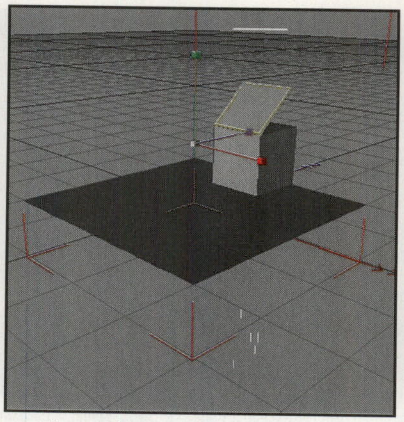
2 First of all create a plane that will act as a floor at 400x400m. On this, create a cube at 200x200m and a further plane, sized and rotated to slant down at the plane above the cube.



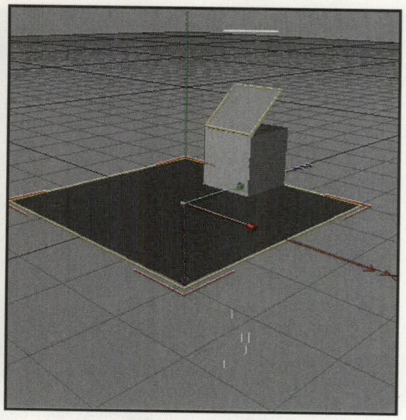
3 Create a Particle Emitter and scale and move it above the cube so the particles fall directly through it. We are going to create a scene where the particles will fall on to the slope and roll off on to the floor.



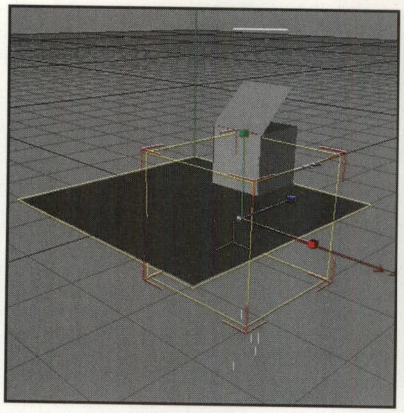
4 To stop the particles from moving through the cube, create a deflector and place and angle this over the slope. Adjust the elasticity to 1 per cent, to prevent the particles bouncing off into space. This will make it appear as though the particles are rolling down the slope.



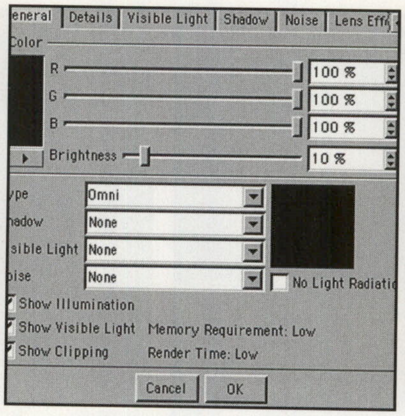
5 The particles now need a gravitational force to pull them down. Choose the Gravity modifier and scale and place this over the plane. The particles will now drop as they come off the slope.



6 As with step 3, create another deflector and place this over the plane and change the elasticity to 1 per cent. This will give a small bounce to the particle objects as they hit the ground.



7 To stop the particles, you can create a Friction modifier. Select it from the Particle System in the same way as the other modifiers, and place it in the particles' path. As they enter this modifier, they'll slow down.



Color

R 100 %

G 100 %

B 100 %

Brightness 10 %

ype Omni

hadow None

sible Light None

oise None

☐ No Light Radiati

☑ Show Illumination

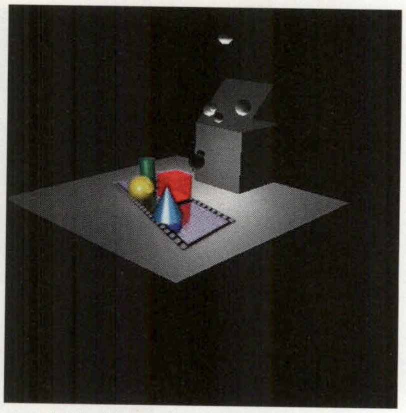
☑ Show Visible Light

☑ Show Clipping

Memory Requirement: Low

Render Time: Low

8 We need to create a particle object – in this case an illuminated ball. Create a sphere and scale it down. Next create a light and take the brightness down to 10. Drop the light on to the sphere, then both into the Emitter.



9 Finish off by applying Materials, Lights to the scene. By pushing the Render button you can check out a still of the animation will look. To see the final result, open the file modifiers.c4d in 'dual/tutorial/particle' from the CD-ROM.

Part 3: Animating with the Particle System

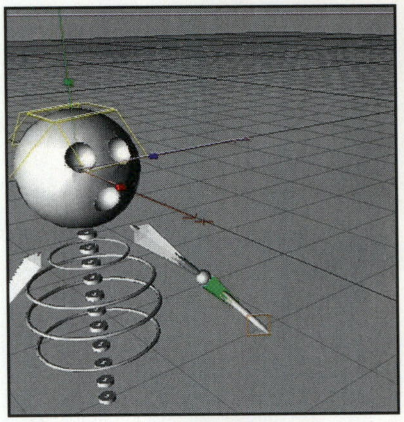
Applying simple techniques of animation with particles – we'll use the Timeline window to make changes to various frames

Bones

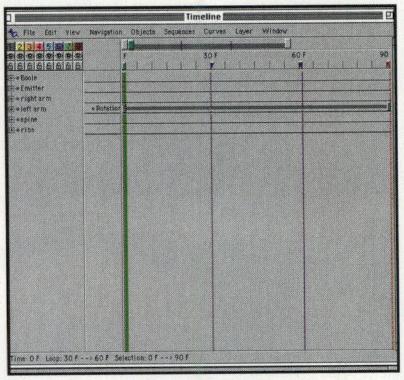
To add simple bones go to the Add, Bend, Deform icon and select the Bones. Move the bone over the limb you want, then push CTRL and pull the orange circle which will make a connected bone. Next drop the limbs on to the correct bone. Now by clicking the IK button on the left you should be able to move the arm around, and by adding restrictions you should be able to get quite natural movement.

Rendering

To render a still, simply click the Render button at the top of the screen (the vase). This will render to the stage and allow you to see how your animation will look. To render the animation, go to Render in the top menu and select Render Settings. In the general tab, it's best to leave most settings as they are but change the Antialiasing to Always. In the output tag, choose the resolution you want and change the Frame to All Frames. In the Save tab change the format to Quicktime movie and enter a name, then in the Path field allocate where you want the movie to be saved. The rest of the options should be fine so close down Render Settings. Finally, to render go back to the Render menu and select Render to Picture Viewer. Press OK, and again to create the document. The process can take a while to complete but afterwards you should be able to see it as a normal video.

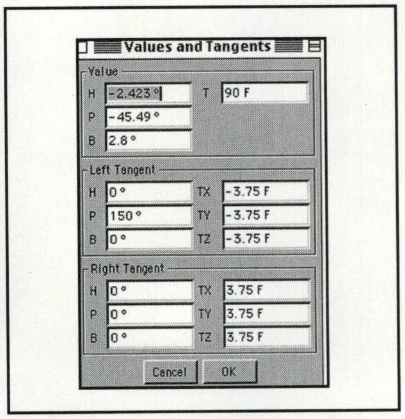


1 Open the file skel.c4d from the dual/tutorial/particle folder on the CD. This is a very basic skeleton with bones laid into the arms for animated movement. This file should help you get started.



Time: 0 F Loop: 30 F --> 60 F Selection: 0 F --> 90 F

2 Open the Timeline window (Shift-f3) and you'll see the components of the skeleton. Select the head and create a track 'file/new track/geometry/rotation'. Right-click in the track that appears and select New Key. It should set the frame at 0.



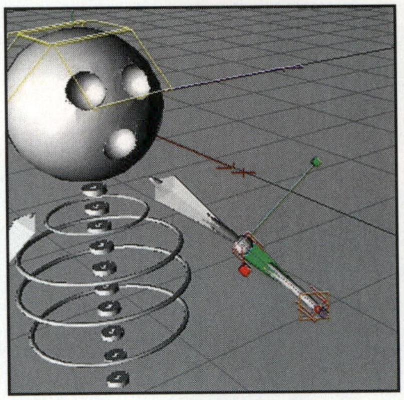
Values and Tangents

Value
H -2.423° T 90 F
P -45.49°
B 2.8°

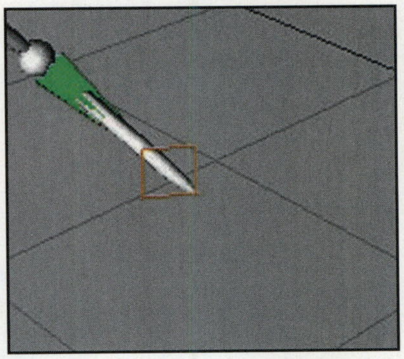
Left Tangent
H 0° TX -3.75 F
P 150° TY -3.75 F
B 0° TZ -3.75 F

Right Tangent
H 0° TX 3.75 F
P 0° TY 3.75 F
B 0° TZ 3.75 F

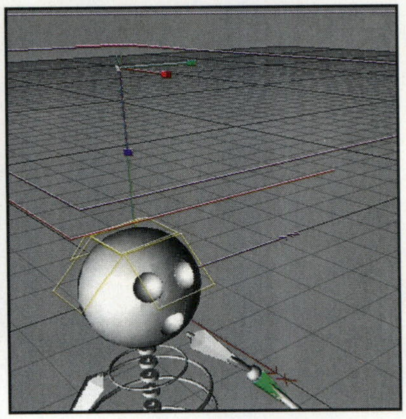
3 Go to frame 90 and add another key, only this time type in 90. We want to get the head to rotate, so type 70 in the H field, which should have just that effect.



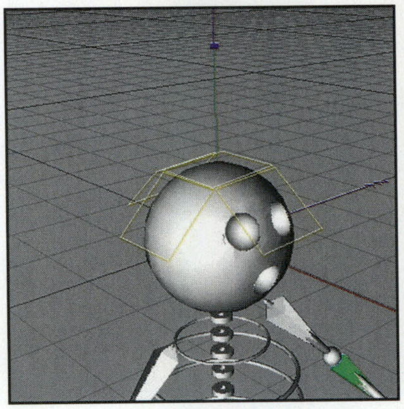
4 The skeleton has two basic bones attached to its arms already. As with the head, select the left arm and create a track. We want the arm to wave vertically so enter -30 into the P field at frame 1 and 40 at frame 90.



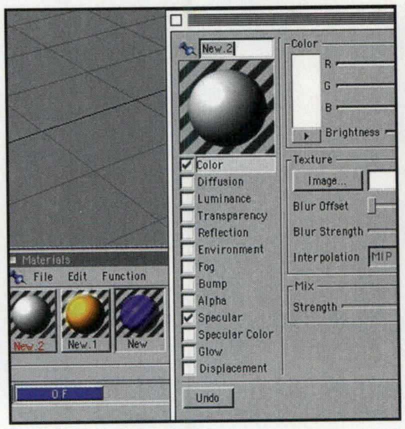
5 Create a Particle Emitter and a small ball with a glowing texture and drop the ball on to the Emitter as before. Place the Emitter over the skeleton's hand and then drop the Emitter into the left hand in the dialog box on the right-hand side. What we have done is to attach the Emitter to the animation of arm.



6 Create a larger Emitter and place this above the skeleton's head. We're going to make it emit light particles that will create shadows and highlights as they fall.



7 Create four Deflector modifiers and Scale, Tilt and Place these around the head – as the light falls, it will be deflected away. Increase the elasticity of these to 200 per cent. Create a Boolean union and drop the deflectors and the head into it.

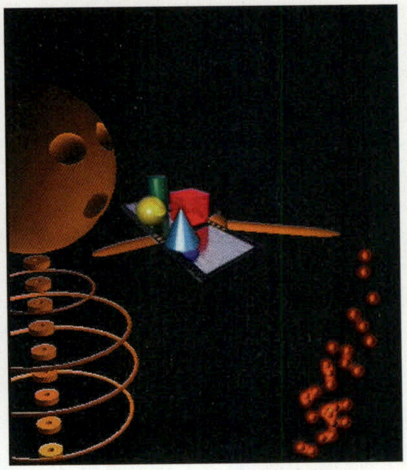


New.2

☑ Color
☐ Diffusion
☐ Luminance
☐ Transparency
☐ Reflection
☐ Environment
☐ Fog
☐ Bump
☐ Alpha
☑ Specular
☐ Specular Color
☐ Glow
☐ Displacement

Interpolation MIP

8 Create three different textures: one for each part of the scene and drop these onto the relevant objects. Move the blue time marker at the bottom along to check all is lined up and working.



9 Open the file final.c4d in 'dual/tutorial/particle' from the CD for the final result. ca>s

Behind every good artist...

Title: Old Fellas
Artist: Robert@trebledee.com

computercreative.com

3D & Video | Web & Comms | Imaging & Illustration | Business & Leisure

Digital Lighting and Rendering

And lo! There was light, and it was realistic...

Price
£38.99

Author
Jeremy Birn

Publisher
New Riders

ISBN
1562059548

Described as: 'The definitive text on lighting for computer graphics... an excellent resource for anyone creating 3D content,' by George Maestri (whose book is reviewed on page 87), this is an excellent buy.

He has examined the art and science of the fine artist and cinematographer — both of whom blend light to create effects and scenes - and applied their techniques to the 3D rendering process.

You begin by learning how to design a basic lighting workflow and quickly apply this to the basic Hollywood style Three-Point lighting technique.

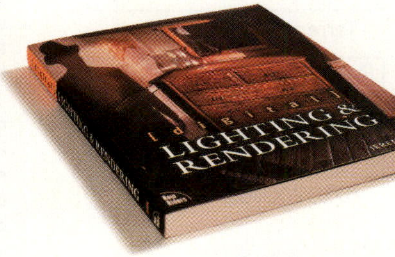
You are then moved on to chapters, all presented in full-colour, that deconstruct the elements of a good lighting technique.

Birn discusses how colour, shadows and the quality of the light that you apply to your scene all have an impact on the completed masterpiece. Later chapters on materials rendering in particular, illustrate how the rendering process can be better handled to push a scene's realism value even higher.

With the final chapter covering multipass rendering and compositing, you will learn how to include your 3D designs with live-action footage.

The discussion, however, isn't completely theory-based. The author has routed his lighting concepts in the real-world, and illustrates how market leading 3D packages such as *Maya*, *LightWave* and *3D Studio MAX* can be used to produce professionally designed lighting scenarios.

To do this, he also illustrates the art behind raytracing, radiosity, photon mapping and caustics. Overall, this is a book that simply can't be ignored. If you



want your scenes to spring to life, then a fundamental understanding of how lighting affects each scene is essential.

This book provides you with this knowledge in abundance.

Verdict
★★★★★

Canoma Visual Insight

Build 3D scenes from photos with Metacreations' *Canoma*

Price
£17.99

Author
Richard H Schrand, Sr

Publisher
Coriolis

ISBN
1576106268

Wouldn't it be great to be able to build 3D scenes quickly and easily from something as simple (and as 2D) as a scanned photograph?

It would also be a real bonus to be able to avoid the long and arduous task of creating custom Bump maps or Specularity maps to give the surfaces of your scene some texture.

Well that's precisely what you can do with Metacreations' *Canoma*. And with this 275-page book in hand, you will become a master of the art in no time at all.

Perfect for the beginner, this manual builds on the information contained with the software's own documentation, beginning with a thorough introduction to the user interface itself.

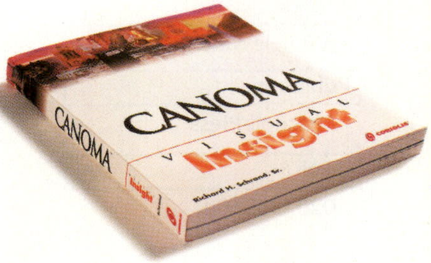
If you are used to the *Poser* or *Bryce* interfaces, you will feel at home with *Canoma*. The first ten chapters cover every aspect of creating a convincing *Canoma* scene from scanning images in chapter three to the all-important chapter nine that discusses how to use your *Canoma* files with other programs.

The author also moves you away from the idea that *Canoma* is aimed only at architects who need to spin, zoom and negotiate 3D buildings for design purposes.

In fact, you can create QTVR style animation in less than half an hour.

You'll also find details on how to use the excellent Sweep tool to include properly rendered people and other set dressing for your scenes without having to resort to other programs.

A series of tutorials illustrating how *Canoma* can be utilised for such things as building 3D Websites and creating revenue on the Web, or designing 3D images for print ads make this a user manual grounded in the user's reality. Later chapters deal with incorporating



Poser, *Bryce* and *LiveMotion*, so you can maximise your software's potential. *Canoma* is a powerful tool that any 3D beginner would find a use for every day of their creative lives and this book is certainly an excellent way to get to grips with it.

Verdict
★★★★★

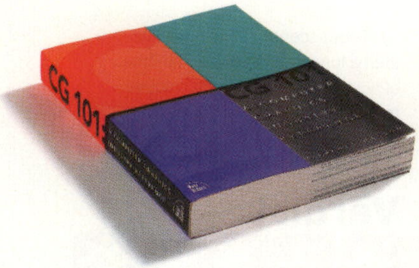
101 A Computer Graphics Industry Reference

Price
£36.99

Author
Terrence Masson

Publisher
New Riders

ISBN
073570046X



Compact and written in plain English, this is the first reference work to attempt to condense the key concepts and techniques of the graphics industry into a reference work that any student, teacher or graphics professional would find useful.

At first glance, this book seems little more than a dictionary, but on closer inspection you will discover that it has much more to offer. Self-contained chapters on subjects such as graphic design, compositing and animation make this an excellent resource.

CG 101 also contains the first published timeline of the history of computer graphics from 1940 to the present – a fascinating read. The author has spent most of his professional life at Industrial Light and Magic, and has condensed a vast amount of his knowledge into this useful book.

Verdict
★★★★☆

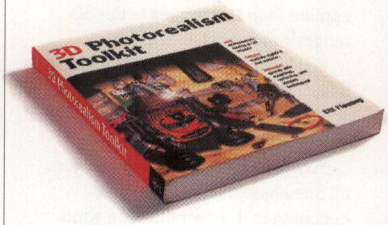
3D Photorealism Toolkit

Price
£25.95

Author
Bill Fleming

Publisher
John Wiley

ISBN
0471253464



Instilling a sense of reality into any 3D scene is perhaps the most important aspect of any design. The novice designer, therefore, will marvel at the contents of this book as it shows how you can increase the reality factor in any of your 3D scenes.

Fleming begins by listing what he calls his ten principles of 3D photo-realism and then proceeds to illustrate how each of these principles can be utilised in your own work. Parts two, three and four of the book takes these principles a stage further and contain hands-on projects.

Not being software specific allows the author to discuss the art of photo-realism without being limited by one software package alone.

Take the advice contained in this slim volume to heart and your scenes will burst with realism.

Verdict
★★★★☆

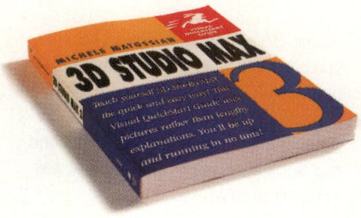
3D Studio MAX 3 Visual Quickstart Guide

Price
£15.99

Author
Michele Matossian

Publisher
Peachpit Press

ISBN
0201353504



Aimed at beginners, this addition to the renowned *Visual Quickstart* series is perfect for any budding designer that has just installed *3D Studio*. Cleanly laid out, this manual should have been shipped with the software as it offers a gentle learning curve for the *3D Studio* novice.

Divided into 13 chapters that take you from getting to know the interface to rendering and special effects within your scenes, you learn by following numbered steps supported by well-chosen screenshots. As you move through each chapter, your confidence will grow as you master the techniques of *3D Studio* designing, including how to select, transform, animate and modify objects.

Later when you are more proficient with the package, this manual acts as a refresher. Indispensable.

Verdict
★★★★☆

Studio MAX 3.0 Workshop

Price
£25.50

Author
Duane Loose

Publisher
Hayden Books

ISBN
0789723433

If you have chosen *3D Studio MAX* as your design package of choice, this manual will take you from installation and set-up to polishing your finished scenes in ten chapters.

Each lesson is divided into two parts. A discussion of creative principles, is then followed by hands-on practical applications that put the theory into practice. Each chapter builds your skills, allowing you to move steadily towards a completed scene.

The lessons are also structured so that a new technique is introduced in each lesson. By the end of the course you will have covered design, structure, animation and modelling to name but a few topics. With a tear-out guide to *3D Studio*'s icons and keyboard shortcuts, plus a CD-ROM of the tutorial files, this is a book any 3D Studio MAX user will welcome.

Verdict
★★★★☆

Advanced 3D Photorealism Techniques

Price
£32.50

Author
Bill Fleming

Publisher
John Wiley

ISBN
0471344036

Following hot on the heels of Fleming's book on photo-realism techniques, this manual builds on the concepts that were discussed in that book, and illustrates how they can be used to great effect in any 3D design.

Again, this book gets your hands dirty from the first page. Split into six sections, each part reaffirms the concepts of 3D photo-realism design before discussing its own subject in detail. Also, this manual deals with outdoor scenes and how to recreate the chaos that is the natural world.

More software specific than the previous book, which allows you to apply the time-saving techniques described, you will learn how to create detailed models and textured surfaces, plus how to mimic the surfaces found in the natural world via displacement maps. An essential buy.

Verdict
★★★★☆

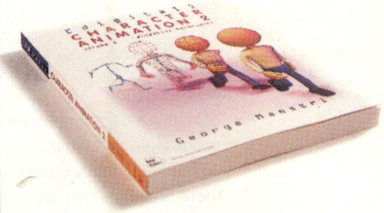
Digital Character Animation 2 Vol 1

Price
£38.32

Author
George Maestri

Publisher
New Riders

ISBN
1562059300



Novice character designers learning how to design and animate world class characters will welcome this expanded edition of Maestri's original book. Maestri now offers more in-depth tutorials to help students gain crucial inside knowledge.

The opening chapter discusses what makes an engaging character, then later chapters look closely at each element that you need to create believable images.

Building the initial skeleton is now dealt with in a much expanded chapter, and Maestri also discusses meshes for hands, faces and bodies.

Your understanding of animated characters will take a quantum leap forward. Presented in full colour, this book will arm you with the essential techniques needed to create characters that engage an audience.

Verdict
★★★★☆

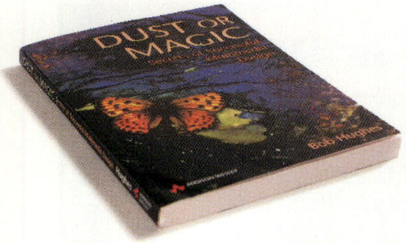
Dust and Magic

Price
£29.95

Author
Bob Hughes

Publisher
Addison-Wesley

ISBN
0201360713



There is more to creating useable digital content than simply being able to use the latest 3D design tools. You need a thorough understanding of how the finished product will be used and how each design element relates to your audience's own experience.

This book teaches just that: it offers an insight into how digital content should be created, and how to avoid some of the pitfalls that await the unsuspecting designer. As Aleen Stein, co-founder of The Voyager Company states, 'It has a unique insight into the creative process.'

Before you even begin to define your first primitive, create a *Flash* animation, or write dialogue for your central character, read this book from cover to cover. Inside you will find a distillation of knowledge that will be invaluable in helping you produce successful work.

Verdict
★★★★★

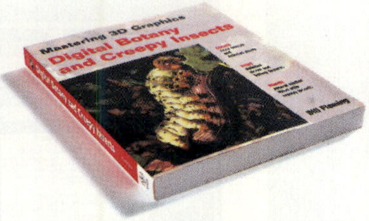
Mastering 3D Graphics – Digital Botany and Creepy Insects

Price
£32.50

Author
Bill Fleming

Publisher
John Wiley

ISBN
047138089X



A photo-realistic environment needs characters to bring it to life. Fleming has culled some of the best tutorials from his online magazine and compiled them into one breathtaking book.

With the book and CD in hand you'll have more than one thousand pages of tutorials. No matter what your favourite software package is, you should find a tutorial that will show you insights into creature design. In fact, you can't fail to improve the realism of your scenes.

The book is divided into two parts. The first looks at how to create digital flora and fauna, with an amazing tutorial on pine trees, and the second section discusses how to create creepy crawlies to inhabit the environment you have just created. Together with *Advanced Photorealism Techniques*, you have one of the best 3D modelling courses currently available.

Verdict
★★★★☆

Web Guide [3D]

A world of 3D info and resources awaits the discerning browser, so whether you're looking for inspiration, artists, techniques or just want to know what's new in 3D, check out this little lot...

Resources

3D World

www.3Dworldmag.co.uk

The industry's leading dedicated 3D magazine presents a colourful site brimming with revelation and inspiration. The news section covers all the latest goings-on and a variety of profiles and features provide behind-the-scenes information.

Practical guidance is provided with in-depth tutorials, downloadable models and textures, and a welcome Q&A section offers expert guidance on those tricky techniques. There's also a thriving exhibition featuring the rendered creations of professionals and readers, all of which adds up to a handy bookmark for the digital artist.

3D Cafe

www.3dcafe.com

Spreading its net far and wide to include almost every imaginable 3D application, 3D Cafe is a treasure trove of downloadable plug-ins, models and other resources.

The searchable database saves you trawling for hours through the site's exhaustive categories, and with provision for CAD and Web designers as well as models and animators, there's info and free stuff aplenty to ensure you'll be back.

3D Up

www.3dup.com

3D Up is a database-driven resource with a cosmopolitan flavour.

Featuring many European artists and companies, there are pleasant surprises to be found among the somewhat bewildering barrage of links, tutorials and products that pop up during a typical search. Useful stuff for all the major packages, high quality freebies and a strong sense of community make this a worthwhile destination.

Computer Arts Online

www.computerarts.co.uk

At the risk of blowing our own trumpet, Computer Arts Online is a bit special. Packed with the top-quality content and resources you'd expect from the UK's favourite creative computing title, there's news, 3D tutorials and art galore. Off you go...

Avalon

http://avalon1.viewpoint.com

Browse this bizarrely Celtic site for a wealth of 3D links and info that must've taken ages to compile. Being the original public 3D archive, Avalon has an impressive collection of its own but also manages to go places other 3D sites can't reach, with esoteric links to some of the Web's best-kept secrets.

3D Links

www.3dlinks.com

Mark Van Buren has truly created a site to rule them all with 3D Links. A breathtaking amount of information is available on every aspect of the subject, and tutorials are a strong point.

A lively discussion forum creates an interactive atmosphere, offering a helping hand with elementary texturing tips all the way up to the most complex modelling and animation problems. Editorial content is clear and concise, with the site also focusing on featured artists and providing reviews and recommendations. Currently the ultimate 3D directory on the Web, or anywhere else, for that matter.

Black Feet

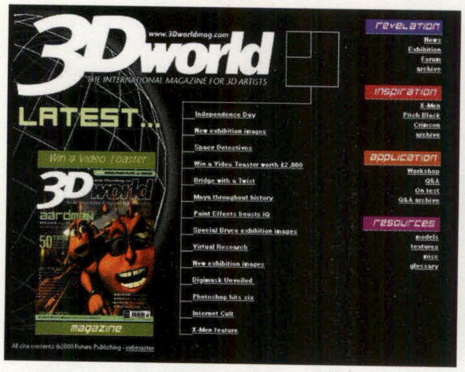
www.blackfeet.com

This chic site offers a collection of downloadable objects and full versions of Blackfeet's various 3D plug-ins, meshes and services. The demos of high-res virtual panoramas deserve a look, and the sheer quality of the site's design is worth the entrance fee alone.

VFX Pro

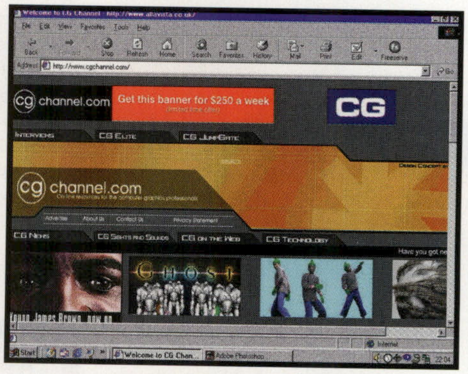
www.vfxpro.com

Written with an insider's insight into the visual effects trade, VFX Pro provides a steady flow of creative



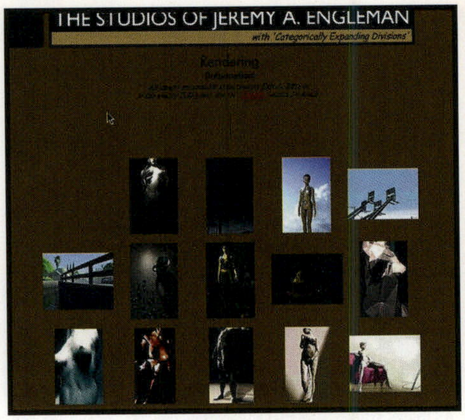
The Website of Future Publishing's *3D World* magazine is packed with tutorials and an insight into digital graphics.

Interviews with and stories on the companies behind the latest developments in CGI, plus job vacancies and news.

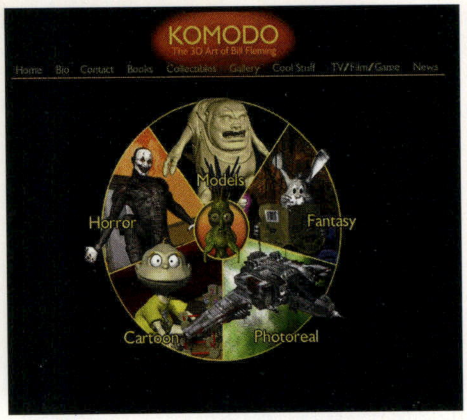


A stylish little number this one, featuring showreels and tutorials from around the Web. Frequently updated.

Lightwave is the centre of this Website's attention. You'll also find lots of supporting plug-ins and tutes.


THE STUDIOS OF JEREMY A. ENGLEMAN
with 'Categorically Expanding Divisions'
Rendering

You'll be 'rendered' speechless by Jeremy Engleman's artwork – explanations of his theory add an extra dimension.



For more on Komodo Studios and the trail-blazing Bill Fleming, take a look at the profile on page 50.

stories and interviews with the companies behind the latest blockbusting CGI developments. Though you won't find tutorials and downloads, there's still more than enough 3D news, job vacancies and background info to keep your eye on.

CG Channel

www.cgchannel.com

The sleek and stylish frontpage links together a selection of the most intriguing 3D stories, tutorials and showreels from around the Web. Frequent updates and an increasing amount of in-house content are presented in an almost TV-like format, so eye-catching animations by digital artists and effects houses are high on the list of CG channel's priorities.

3D Ark

www.3dark.com

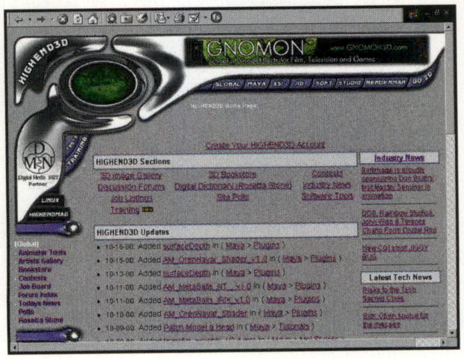
This slick portal site that promises a wealth of resources, was being rebuilt at the time of writing due to a recent hard-drive crash. In the meantime there's still plenty of intriguing content, especially the online software and plug-in store and the wealth of archive material. Some novel ideas, such as an Ask The Experts Q&A section, regular contests and a useful soap-box section make for a satisfying stay.

Software

The Poser Forum Online

www.iguanasoft.com/poser

If *Poser*'s posing problems, you'd better head over here. Join the package's cult following in discussing all aspects of *Poser*dom, and choose from a selection of downloadable props to bring your creations to life. There's a gallery section and news from the 3D industry, proving there's life beyond this cult package.



Specialising in *Maya* and *Softimage*, Highend 3D doesn't disappoint with downloadable assets and galleries.

KPT Bryce Tips

www.halcyon.com/alrives/brycetips

Bryce and easy does it at the home of the Bryce community. Tips and tutorials date back to the dawn of the software, and the message board, when it isn't inundated by spurious offers for free skateboard gear, offers a useful forum. Galleries and a *Bryce* Masters Series round off a lively, edifying site.

Animation Master

www.hash.com

Whether you use Hash Inc's *Animation Master* or not, it's worth visiting to check out the cool collection of Quick Time movies, with topics ranging from alien gun tests to peculiar bison renderings. If you're sufficiently impressed, you can buy the package online and enter the monthly art competition.

Highend 3D

www.highend3D.com

A great destination for the *Maya* and *Softimage* afficionado. The site benefits from its specialisation, and searching a particular package reveals downloadable assets divided into specific areas such as modelling/weighting, animation, fur and lighting. A must-see site for the high-end user, with must-see galleries for everyone else.

Pixels 3D UK

www.pixels3d.co.uk

Mac users concerned about support for the 3D capabilities of their computer should stop off at Pixels 3D UK. The quality of the rendered art on display is second-to-none, and the mix of biomechanical creations in the galleries shows the strengths of the software off to a tee.

Flay.Com

www.flay.com

Newtek's ever-popular *Lightwave* is the focal point of Flay.com, and the package is well supported by plug-ins and tutorials. It's far from a one-trick pony however, and the industry news and animation sightings sections discover some fantastic 3D movie work from the industry's finest practitioners, as well as providing a fair share of up-to-the-minute scoops.

Alice.com

www.alice.com

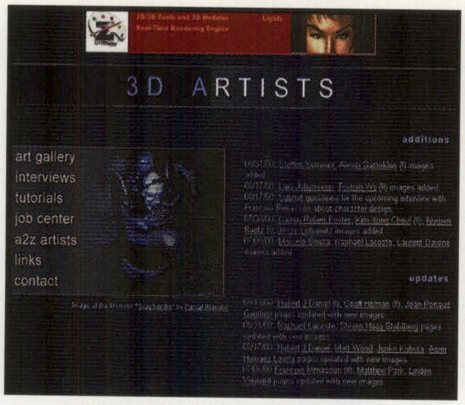
Alice is a 3D authoring tool for building and animating

Web 3D

Even though the jury's likely to remain out for some time to come on the most viable solution for putting 3D on to the Web, there are plenty of sites out there offering a way in for Web designers. If you're tired of waiting to catch the high-bandwidth train, you could start by checking out some of these alternatives.

Cult 3D **[w]** www.cult3d.com has a gallery and the latest news on Cycore's viewer and Web 3D design package, which specialises in product visualisation for e-commerce sites. Similarly, the Pulse Player **[w]** www.pulsenetwork.com offers the *Pulse* browser plug-in as well as information about the *Pulse Creator*, and of the content it has so far created, a virtual playroom and a phony Tony Blair are two of the highlights. *Flash* fanatics could also try Vecta 3D **[w]** www.vecta3d.com, which offers the inexpensive *Vecta 3D* package for creating shaded 3D objects for the Web with ultra-low file sizes. The package also comes in *3D Studio MAX* flavour, offering more sophisticated options for *MAX* to *Flash* transfer. Then there's the unique *iSpace* package **[w]** www.caligari.com – a WYSIWYG Web editor that applies 3D to the actual design environment itself and outputs 3D pages to a range of standard HTML editors.

Catch up on the best animated shorts and post your comments directly beneath the viewing window.



All things arty on 3D Artist's Website – insights, inspiration and in-depth interviews with contemporary designers.

Quick Time movies on a whole range of topics on the Animation Master Website, which also runs a monthly art competition.

3D environments and scenes for the Web. The product was originally developed as a University of Virginia project, and though it may not be about to steal *Maya*'s crown, it does have the advantage of being completely free to download and use.

So if you're new to 3D and fancy having a meddle, what are you waiting for?

Galleries

The Studios of Jeremy A Engleman

http://art.net/~jeremy

Jeremy Engleman is revered in the digital art community for his fearless fusion of 3D and elements of traditional art history (see issue 9 of *Computer Arts Special* for more on Engleman's art).

Check out his site for the artwork itself and a lesson in precisely how to showcase it. Once you've admired the renders on display, take a tour around the array of distracting oddities that Jeremy has included, such as the 24 hour studio Web cam. Explanations of the theoretical background to his work add an extra dimension to an already fascinating site.

It's Ming!

www.its-ming.com

Although it's a shop window at heart, It's Ming! is worth visiting to sample the technicolour splendour of its cartoon characters. Some of the most inventive work in the 3D field is produced for children's entertainment, and the models on sale from this site show a crazed, quirky imagination at work.

Komodo Studio

www.komodostudio.com

No tour of the Web's 3D resources would be complete without delving into the meticulously detailed world of Bill Fleming's Komodo Studio. A fully-fledged production company headed up by the most famous artist in 3D is bound to produce something special, and the site doesn't disappoint. Divided into generic categories like photo-realism and horror/fantasy, Bill and Komodo's work really is the last word in professional 3D design. Be inspired.

iFilm

www.ifilm.com

The animation section of iFilm regularly showcases some of the best amateur and professional 3D film shorts anywhere on the Web. If you feel strongly enough about such art-house classics as *Psycho Legos* (a remake of Hitchcock's classic shower scene, but with lego characters) you can post your comments directly beneath the viewing window.

3D Artists

www.raph.com/3dartists

A cornucopia of awesome 3D illustration, 3D Artists goes the extra mile by adding tutorials and in-depth interviews covering inspiration, modelling, texturing and other aspects of the content creation process. Offers insight and inspiration into the most important stuff of all – the art itself.

3D Animation Workshop

www.webreference.com/3d

Tutorials on the art of using *3D Studio MAX* are gathered here on a bi-weekly basis, and with 80 or so there at the time of writing, they should keep budding *MAX*-ettes busy for a while to come. It's not pretty, and has few pics or animations, but is a top reference nonetheless, not least because it's free. ca>s

Squidgital assets

Time is of the essence for the 3D community. Large-scale animations usually require legions of high-res NURBS or polygonal mesh 3D characters and objects.

Modelling and texturing these from scratch, or painstakingly recycling past designs, is at best impractical, at worst, impossible.

But for many designers, there's no shame in taking a shortcut, especially if it frees up time to concentrate on other aspects of the project.

Recognising the need for an off-the-shelf service, various companies provide libraries of textures and meshes for the animator in a hurry.

Viewpoint Corporation, **[w]** www.viewpoint.com, is one of the foremost of these services, with an exhaustive catalogue of 15,000 low to high-resolution models that it regularly supplies to broadcast, film, game and Web companies for downloading over the Web.

Turbo Squid Inc. at **[w]** www.turbosquid.com, goes a step further still. Providing a free software interface that can run on its own or within a user's 3D program, Turbo Squid consists of a searchable asset library from which users drags-and-drop the models and textures they need, while the program logs the transaction automatically.

Turbo Squid describes its service as the world's first all-digital marketplace, and the speed, rapid location of assets and the ever-expanding range of content on offer has won many industry plaudits.

The company also plans to introduce downloadable plug-ins in the future, and hopes to revolutionise the way assets are distributed in the 3D industry.

Don't be a sucker! Save time by drag-and-dropping the models you need from the 'world's first all-digital marketplace'…

Without inspiration it's just
a £2,500 paperweight...

Read the first issue on sale now

DV World

The Creative Digital Video Magazine

CAPTURING • EDITING • COMPOSITING • SPECIAL EFFECTS • WEB•STREAMING

Glossary [14/12.00]

The world of 3D jargon is littered with abstruse words and phrases and more are being invented all the time so, to make life easier, here's a few of the main terms explained...

3D (Three dimensions)

A term that describes an area of space that has depth, width and height. 3D modelling is the basis for many TV and movie effects, and is extensively used in printed advertising and games.

24-bit — See Bit and Bit Depth

24-bit describes the number of bits that are used to store information about colours. Each bit has just two states, on or off.

A single bit enables you to represent black or white (on or off), and each subsequent bit doubles the number of colours that can be addressed. 24-bit provides a palette of 16.7 million colours, and is considered to be the widest range of colours that the human eye can detect.

3D Workspace — See Camera and Viewpoint

This describes the area of the screen in which you can manipulate 3D elements during the construction of a scene.

Absolute Co-ordinates/Position — See Relative Position and Co-ordinates

Any location within a 3D scene may be described using three numbers that represent an X, Y and Z position – height, width and depth.

An absolute co-ordinate system is one where the co-ordinates are aligned according to a fixed point in the 3D universe. Any position described using an absolute (or universal) co-ordinate system, is also considered to be absolute.

Algorithm

Algorithms are a type of mathematical formulae and they're widely used in 3D. They're most commonly used to generate textures, but are also used to create mathematically-based behaviour patterns for particle systems such as smoke and fire.

They are also used to calculate movement paths and to work out the distribution of particle-based objects, such as leaves on a tree.

Alignment — See Justification

When you need to position objects in a scene, it's often easier, if not essential that you position them relative to other objects. You can align them using a variety of spacing options, perhaps using object centres or edges in order to arrange the items.

Anti-aliasing — See Jaggies

When objects are placed against contrasting backgrounds, the high-contrast of their edges, as well as the effect of drawing using digital pixels rather than analogue lines and curves, often produces unnaturally precise edges or even a stepped effect called 'the jaggies'.

Anti-aliasing is the process of softening these edges by using pixels of intermediate shades (between the object and background shade) as a buffer.

Aspect Ratio

Aspect ratio describes the equilibrium between the X, Y and Z dimensions of an object. For example, if you make an object wider without increasing its height and depth, it has lost its original aspect ratio.

Atmospheric Effects — See Volumetrics

3D effects such as smoke, fog, haze, rain or snow. They can be used to affect the mood of a scene.

Attitude — See Pitch, Yaw and Roll

Also known as Orientation. Attitude is an aeronautical term that's used to describe the way an object is facing. It's comprised of three values: pitch, yaw and roll. Each of these is described using degrees of a circle.

Axis

An axis is an imaginary line around which an object may rotate, or across which it may be mirrored. It can be used to position or build objects.

Backdrop

A backdrop is the raster (bitmap) image that's used as the background of any 3D scene.

A backdrop can be static or animated, it may come from a file stored on disk, such as a digitised photo, or it may be a calculated (algorithmic) texture that your computer generates on the fly.

Bank — See Yaw

Bézier Curve — See Spline

A method of drawing a smooth curve using four control points at the ends of the tangents of the vertices. The angle of the curve is adjusted by dragging these control points. Because of rendering and mathematical imperfections, it's generally considered unwise to use Bézier curves to describe more than 90 degrees of an arc. If you wish to draw a greater arc, add more Béziers.

Biospheres AKA Metaballs or Metablox

Basic organic shapes (mostly blobs) that are used as the building blocks for complex organic shapes. Each blob has a user-definable level of attraction or repulsion towards others, enabling you to build forms that would be much harder otherwise.

Bit

The smallest unit of memory or hard drive storage.

Bit Depth — See 24-bit

Colours are represented in computer memory using numbers. The larger the number, the more storage space (bits) is required to hold it. Bigger numbers mean bigger palettes of colours to choose from, and that in turn means more accurate rendering of a scene. The most common values are:

1-bit – black and white
8-bit – 256 colour – the maximum allowed in GIFs
16-bit – high colour – commonly used for games
24-bit – 16.7 million colour (AKA True Colour) RGB – ideal for film
32-bit – CMYK for printing or RGB with an alpha channel for film.

BMP — See JPEG and TIFF

A popular multi-platform image format. It produces very large file sizes.

Bounding Box — See Projection

Every object occupies a certain volume in space. A bounding box is the rectangular shape often drawn around an object to enable you to see the volume occupied by that object. With some programs, or in certain modes, it may be too processor-intensive to display the actual object when manipulating it, so manipulations are performed upon the bounding box, and the object is updated accordingly when you've finished.

Bump Map — See Displacement Map, Texture Map and Mapping System

A monochrome image that is used by your 3D program to simulate three-dimensional detail without the need to actually model the detail.

For instance, it's far easier to apply a 2D drawing of a complex Gaelic pattern to a goblet, than it is to sculpt the same pattern into the cup. Bump maps are also less computationally intensive, because they only modify the colour (and perceived depth) of a surface, and not its actual geometry.

Camera — See Dolly, Pan and Track

The camera represents the viewer's eye on your 3D scene. When the scene is rendered in final quality, it is the camera view that is used, rather than what you see in the 3D workspace. This enables you to move around the workspace without disturbing the camera view. In older 3D packages, the camera and the 3D workspace view are the same thing.

Child — See Parent, Hierarchy, Kinematics and Inverse Kinematics

When defining relationships between parts of a model, a child part is one that has been linked to a parent part. Although the child part may have its own range of movement, it must go where the parent part goes. However, inverse kinematics may be used to make the parent part follow the child.

Colinear — See Concentric and Coplanar

Two or more objects in the same line.

Complex Object — See Primitives

Any object constructed from two or more simpler objects.

CMYK — See RGB

CMYK stands for Cyan, Magenta, Yellow and Black. It's a colour model in which all colours are described in terms of their percentages of each colour. It's primarily used for printing and it has a smaller gamut (palette size) than an RGB colour model of the same bit depth.

Compression

A technique for reducing the size of data so that it occupies less space. Sometimes the technique is non-destructive (such as when using ZIP compression to reduce the size of a data file), and other times it is destructive (lossy) as in JPEG and fractal picture compression, which permanently discards image information.

Concentric — See Colinear and Coplanar

Two or more objects having a common centre.

Constrain — See Planes

Constraining is the process of restricting movement to one or two planes or axes to simplify construction or animation.

Control Points

Control points are small 'handles' – usually rectangles – that are used to manipulate part of a model or an entire object.

Co-ordinates — See Absolute Co-ordinates and Relative Co-ordinates

A set of numbers used to denote a location in 2D or 3D space. X and Y (horizontal and vertical) values are used in 2D space, and a third Z (depth) value is used in 3D space.

The origin (zero point) of the co-ordinate system may be absolute or relative.

Coplanar — See Colinear and Concentric

Two or more objects sharing the same plane.

Cross-section AKA Profile, Shape — See Lofting, Extrusion and Lathing

A cross-section is a two-dimensional outline used as the basis for extrusion and lathing. It's also a two-dimensional shape that represents a slice taken through any given point of a model. Drawing multiple cross-sections and joining them together, or covering them in a 'skin' is an easy way to build complex irregular shaped objects.

Deformers AKA Modifiers

Different packages use this term to mean different things, but, in general, a deformer is a tool that deforms an entire object. It might be a Magnet or a Bend tool, or it might be something more abstract.

Diffusion

The property of a surface that determines how it responds to light.

Displacement Map AKA Height Map — See Bump Map

A new innovation and an advance on Bump maps. A Displacement map is a greyscale 2D bitmap which, when applied to a model, modifies its actual geometry.

Distribution — See Alignment

A tool for positioning objects in an ordered manner throughout a scene.

Dolly — See Pan and Track

Some 3D programs use film analogies to describe the movement of the camera around the scene. When using a dolly, the camera moves around the scene as if it was on the outside of a sphere, while always pointing at the focal point such as an object or an area of space.

DXF

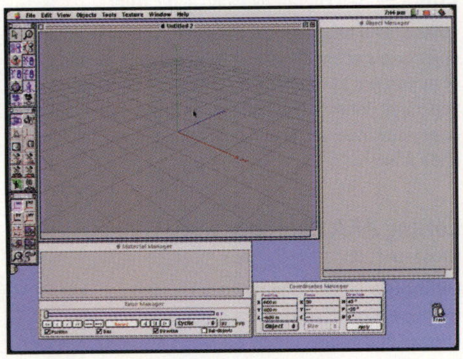
A basic 3D model format originally developed by AutoDesk for the exchange of CAD models. DXF files are only capable of carrying mesh information, and not textures, Bump maps or any other advanced data.

Face — See Extrusion

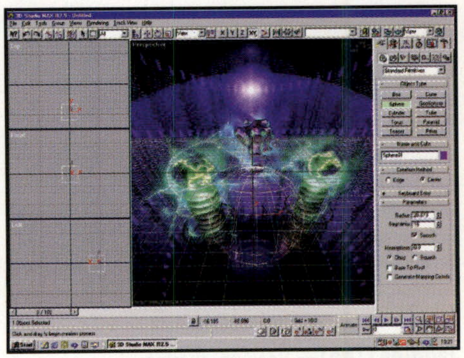
The front or back of an extruded object. The shape from which a 3D object has been extruded.

Flux

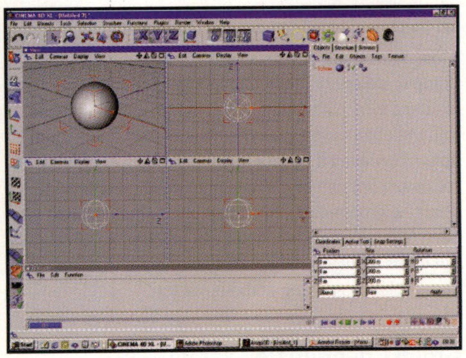
A term that describes the flow rate of a particle-emitting modelling tool, such as an Airbrush.



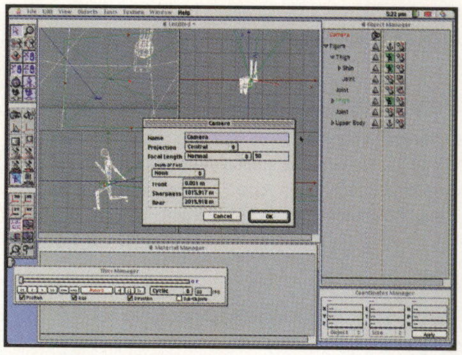
X, Y and Z are represented in most 3D apps by coloured arrows so you can rotate, scale or move around the desired axis.



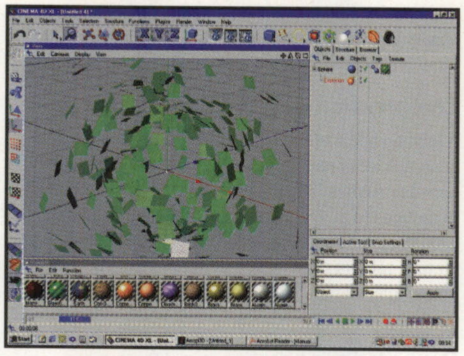
Importing a bitmap image into your 3D scene as a backdrop can help you line up various elements with great precision.



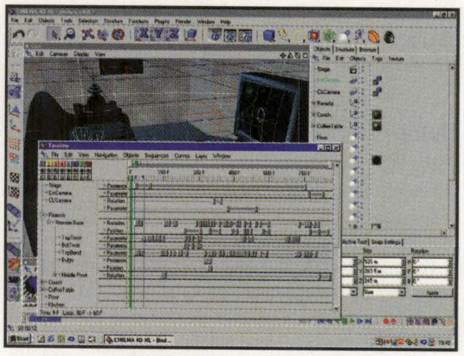
The exact volume of the sphere above can easily be seen, thanks to the rectangular bounding box surrounding it.



Cameras enable you to move freely around the workspace without disturbing the camera view.



Here, an explosion deformer has been applied to a sphere primitive. This deformation can also be animated over time.



Most 3D apps have a timeline in which you can create and manage complex animations.

Formula — See Algorithm.

FPS — Frames per second

The rate at which an animation or movie is replayed. 25 frames per second is the UK standard for animation, and the human eye cannot discern distinct frames when they are replayed at this rate.

Frame

A single picture that is part of an animation or movie.

G-Buffer — Geometric buffer

An extra channel of information that is saved with a two-dimensional image.

It carries Z-buffer (depth) information about every pixel in the image. This enables retouching and compositing programs to manipulate the two-dimensional image in three-dimensions.

Global AKA Universal

Global means 'pertaining to the entirety of your 3D world', rather than just the view or object you're currently working on.

Glow Channel — See Luminosity

Another name for a Shader channel that describes an object's luminescence.

Group — See Alignment and Distribution

Most models are constructed from several less complicated parts, then joined together into the finished form. With many 3D programs, if you simply join the objects you cannot subsequently break them apart. However, if you merely group them, then they'll move and behave as a single entity, yet can be split apart (ungrouped) if you subsequently need to edit any part. Grouping is also a good way of locking the relative positions of different objects that need to maintain the same relative spacing and orientation.

Group Co-ordinate System — See Co-ordinates and Relative Co-ordinates

A group co-ordinate system is a form of relative co-ordinate system based upon the current group.

GUI — Graphical User Interface

The icon-based interface that enables you to control your 3D application. Some programs, such as *Caligari*, pride themselves on an intuitive and innovative interface, but most programs stick to safer conventions, using similar icons and tools to represent the same functions.

Height Map — See Displacement Map

Hierarchy — See Parent, Child, Links, Kinematics, Inverse Kinematics and Group

Hierarchy defines the relationships of objects to each other. Objects can be parents, children or independents. An object may the parent of one or more others, and the child of another. These relationships are important in defining the range and nature of each object's movement.

Highlight

Any part of a surface where light reflects directly into the camera or viewpoint. The smoother and shinier the surface material, the stronger the highlight.

Hotpoint

The place on an icon, tool or object that you must position the cursor over in order to select the item in question.

Isometric Perspective AKA Forced Perspective — See Perspective

A way of drawing a 3D scene using false perspective that doesn't account for the convergence of parallel lines over distance. This is far less processor-intensive and can sometimes produce greater clarity because of the uniform appearance of all angles regardless of their distance. It's often used for games.

Jaggies (The) — See Anti-aliasing

Because objects drawn on a computer screen must be represented using small square or rectangular pixels, any line not drawn at an angle that is a multiple of 90 degrees, produces a visible stepped effect.

The greater the contrast between the line colour and the background colour, and the lower the screen resolution, the more visible the effect. The jaggies can be disguised using anti-aliasing or by using a high image resolution.

JPEG (Joint Photographic Expert Group) — See BMP and TIFF

A popular multi-platform image format. It uses compression to massively reduce the amount of storage space required. However, it uses destructive (lossy) compression, so it is not suitable for final output, but can be used to import large Texture maps.

Justification — See Alignment

When handling text, justification describes the way that the words are distributed across the width of the page or workspace.

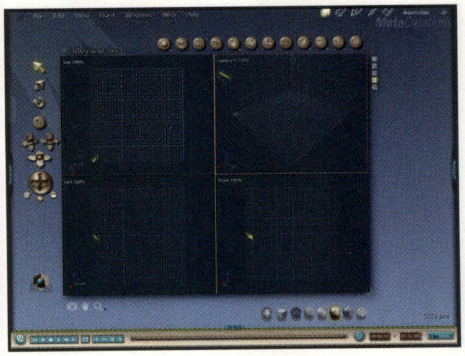
With right, left or centre justification, no additional spacing is used, but the text is aligned with the left, centre or right of the workspace. With flush (also called justify, full or forced) justification, spaces are inserted between words so that the text perfectly fits the width of the page or workspace. A block of 3D text is an entity in itself, and regardless of the justification of the text within the block, it may still be aligned or distributed with other objects.

Links — See Hierarchy, Child and Parent

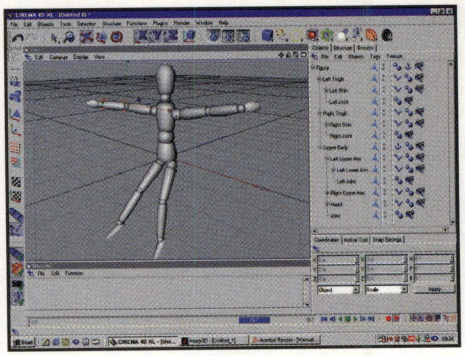
Links define relationships between parts of a model or objects in a scene. They also define the range and type of movement available to child objects. For instance, you might define a ball and socket link for a female hip bone. However, you would only need a pivot link for the knee joint.

Lofting AKA Skinning — See Extrusion and Cross-section

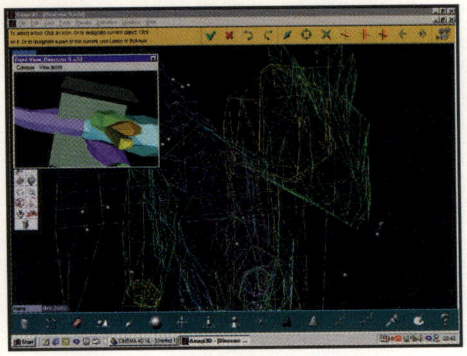
Lofting is a way of building models using cross-sections. Two or more cross-sections are created and connected by a sweep path. A 'skin' is then wrapped around all the cross-sections, connecting them into a single object.



Carrara (pictured above) has a graphically intensive interface that takes a little longer to get used to.



Above, in *Cinema 4D*'s Object Manager, you can see the IK hierarchy for this primitive figure.



A mesh is formed when polygons are joined together. This dinosaur was formed within the 3D app, *Amapi 3D*.

Lossy

Referring to compression techniques, lossy means that the end result is not as good as the original. Some of the original data is lost – more accurately, it's discarded.

Mapping System – See Texture Map, Bump Map, Displacement Map and UV Mapping

A mapping system determines the way that Texture, Bump and Displacement maps are applied to objects. They may be wrapped, projected or applied using a variety of advanced techniques.

Master Object

When a single object is used as the source for multiple duplicates, all of which are modified whenever the original is changed, this object is the Master object.

Master Shader – See Shaders, Sub-shaders and Textures

Each object may only be assigned one shader (although if it's a composite object, each sub-part may also have its own shader). The shader assigned to an object is called the Master shader. The Master shader may be constructed using multiple sub-shaders.

Mesh – See Polygon

When polygons are joined to create an object, the surface that they form is called a mesh.

Model

Used as a verb, model means to build an object. Used as a noun, model means any 3D object.

Modifiers – See Deformers

Morph

To transform from one state to another. Morphs are usually applied to objects to change their shape.

Motion Path

A path (line) that can be defined for an object to follow. It may be a two-dimensional path on the floor that a ball rolls along, or it may be a complex three-dimensional one that a far more complicated object follows.

You can also define motion paths for cameras and lighting rigs to follow.

MPEG (Motion Picture Experts Group)

A highly compressed and lossy form of video ideal for multimedia streaming. Higher bit-rate versions are used digital television and DVD.

Normal AKA Normal Vector – See Polygon

A normal is an imaginary line that leaves the centre of a polygon at right-angles to its surface.

Normal Vector – See Normal

Object

Object is a generic term describing any physical item that can be inserted into and manipulated within your 3D universe. Models, primitives, lights, particle emitters and cameras are all objects.

Object Co-ordinate System – See Co-ordinates and Relative Co-ordinates

When a co-ordinate system is mapped to the current object, you're using an object co-ordinate system. This relative co-ordinate system makes it easier to construct objects.

Orientation – See Attitude

Origin – See Co-ordinates

The point in a co-ordinate system where all measurements or values are 0. The point from which measurements begin.

Oversampling

The process of rendering a scene at a higher resolution than needed, then shrinking the finished image in an effort to reduce aliasing effects.

Pan – See Dolly and Track

Some packages use a film making analogy to describe the movement of cameras within your scene. Pan is the opposite of Dolly. When a camera pans, it remains at a fixed location and tilts and swivels in any direction to follow the action.

Penumbra – See Sharp Terminator

The transition point between full shadow and full lighting. Partial shadow.

Perspective – See Isometric perspective

A way of drawing a 3D scene that takes account of distance. In other words, parallel lines move together as they recede into the distance.

Phong – See Shading

Phong shading is a method of depicting 3D objects that is not processor intensive, making it ideal for real-time animation previews. Phong shading assesses the shade of each polygon, and interpolates its colour based upon the shade of its neighbours. It then performs smoothing calculations to the edges of every polygon so that the edges are smoothed.

Pipeline – See Extrusion, Translation and Sweep Path

Pipeline is a form of extrusion where the cross-section is always at right-angles to the sweep path.

Pitch – See Orientation

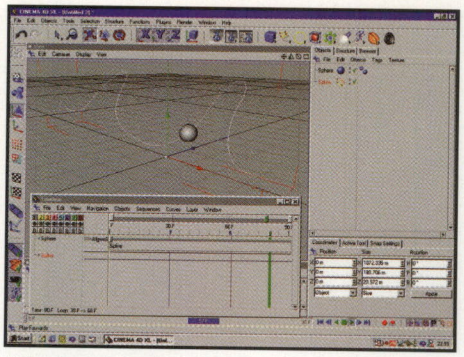
One of the three values (pitch, roll and yaw) that describes an object's orientation. Pitch describes the object's rotation around its Y-axis.

Plane

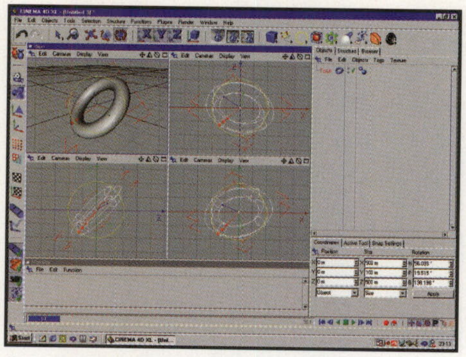
A two-dimensional construct used to aid object manipulation, positioning and construction.

A plane is essentially a flat sheet extending infinitely in all directions. Unless specified, a plane is just a construction device, visible in your 3D workspace, but not in your final image.

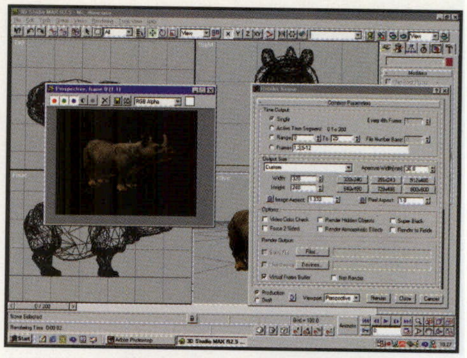
In some situations, you may make a plane visible – the ground plane for instance. A scene may contain an



Animating objects along a path can be a great time-saver. Luckily, *Cinema 4D*'s intuitive timeline makes this a breeze.



Primitives are a starting block for many complex objects. Pictured above is a torus – one of the standard primitives.



Rendering your 3D masterpiece can be daunting – getting the correct shading, lighting and so on can take many an hour.

infinite number of planes, created and selected by you as required.

Point

A generic term used to mean many things. In printing terms, a point is a unit of measurement 1/72 of an inch in size. In 3D terms, a point may refer to a control point on a model, a Bézier curve vertex handle, a node on a mesh or more.

Point of View – See View

Pressure

Determines the amount of influence that a brush or tool has upon an object. More pressure means more influence.

Preview – See Render

A time-saving method of checking the progress of a project by rendering it at a lower quality, resolution or frame rate than will be used for the final project.

Primitive – See Object, Complex Object and Model

A primitive is a basic model that may be used as the basis for more complex models. Cube, sphere and torii are all primitives.

Production Frame

The area of your scene that is visible through the camera, and hence, the area that will be rendered in the final production.

Profile – See Cross-section

Projection

This has several meanings according to context. In some 3D programs, it's possible to project a silhouette or the bounding box silhouette of the objects in your scene on to all or any planes to aid positioning. These silhouettes are called projections. Also, when choosing the method of assigning textures or shaders to an object, projection is a method that assigns the texture as though projected on to the object from a single side. Other programs (such as *3D Studio MAX*) create the same effect using lights (called projectors), and it's even possible to project movies on to surfaces.

Quicktime – See MPEG

A multimedia movie format developed by Apple, popular because of its cross-platform compatibility.

Raytrace – See Shading and Render

Raytracing is a technique for rendering 3D scenes. It traces every ray of light from its source until it leaves the scene or becomes too weak to have an effect. It's a massively processor-intensive rendering technique, but produces by far the most accurate images.

Reference

A fixed point in a plane, object, group or universe that's used as the basis for further operations, be they measurements, movements or object constructions.

Reflected Background – See Environment Maps

When including surfaces in a scene that are capable of reflecting their environment (such as mirrors, glass or liquids), your 3D package will reflect other 3D objects that you have included in a scene, but you'll need to assign an Environment map if you want to reflect a background image.

This is most likely to be the case when the scene is set outdoors, or against complicated, non-rendered backdrops.

Reflection

The action of light rebounding from a surface. The shinier the surface, the more of the light's original colour will be maintained, and hence the clearer will be any reflected image.

Relative Co-ordinates/Position – See Co-ordinates and Absolute Co-ordinates

Any location within a 3D scene may be described using three numbers that represent an X, Y and Z position. Although the Universe has an absolute co-ordinate system with a fixed origin, you can overlay further sets of co-ordinates by defining the origin (zero point) of the co-ordinates.

This is usually done by aligning the new co-ordinates to an object that you are working with, and it enables you to position other things relative to the object more easily.

Render – See Preview and Shading

Rendering is simply a computer term for drawing. It describes the action of displaying your 3D scene using the shading method that you have specified.

You probably work with a low quality preview version, which is possibly enhanced using *Open GL* or another 3D API. However, it doesn't display the full subtleties that would be present in a properly raytraced image.

Because raytracing is very processor intensive, you have to specifically tell the computer to render an image using this method, and, even then, you may opt to omit some of the more advanced features, such as full anti-aliasing.

Resolution

Resolution has multiple meanings according to its context. When you're building a 3D model, it may refer to the number of data points that are used to construct meshes or curves. The more points, the higher the resolution and the smoother the curves.

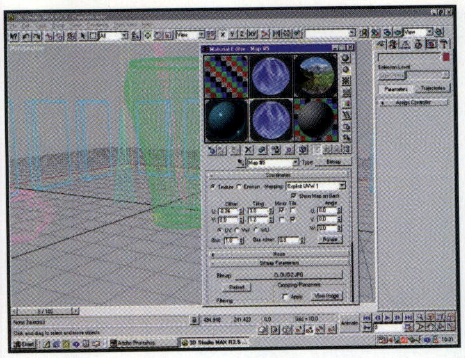
When rendering an image, the resolution simply describes the size of the final image in pixels. Again, a higher resolution means more detail.

When talking about your screen, higher resolution means that the display is comprised of more pixels, which are smaller in size. This means you can view larger images and see finer detail without magnification.

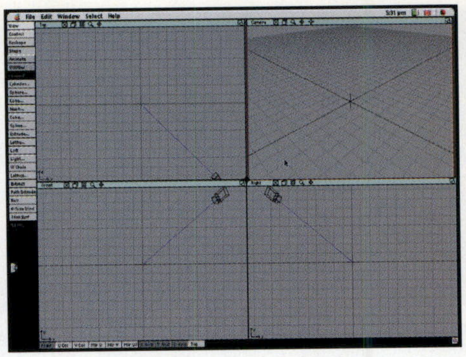
RGB – See CMYK

RGB stands for Red, Green, Blue and it's the standard colour model for multimedia and film production work.

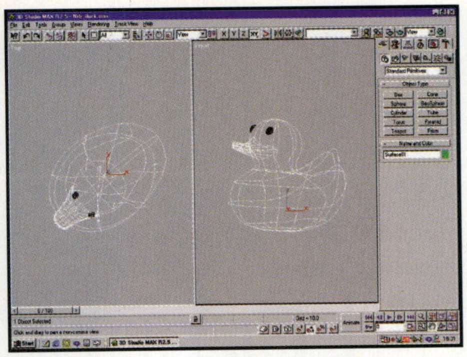
All colours in an RGB colour space are represented by three values representing the amount of each primary colour used. 0,0,0 is black (a complete absence of any of the colours), and 255, 255, 255 (in a 24-bit palette) is white.



In most apps (including 3D Studio MAX), a preview of the Texture map can be viewed.



Almost all 3D applications enable you to see your work in four views – Front, Side, Top and Perspective.



With the wire frame method of shading, you're able to see the contours and faces of an object that would usually be hidden.

Roll — See Orientation

One of the three values (pitch, roll and yaw) that describes an object's orientation. Roll describes the object's rotation around its X-axis.

Rotate — See Pitch, Yaw, Roll

The process of pivoting around an axis. The terms Pitch, Yaw and Roll indicate rotation around specific axes.

Scaling

The process of resizing something.

Scene

A 3D set. You select a specific area of the scene to become a production frame using the camera.

Shading — See Phong, Raytrace and Wire Frame

The method used to render a scene. 3D objects can be drawn with varying levels of precision, each of which represents the colours and lighting in the scene with greater or lesser accuracy.

The simplest is wire frame, and the most comprehensive is raytracing. The more accurate the shading, the more time it requires to produce.

Skinning — See Lofting

Spline — See Bézier Curve

A Spline is essentially a 3D version of a Bézier curve. It's ideal for creating organic forms because it produces gentle curves and transitions from one curve to another.

Sub-shader — See Master Shader and Shader

A sub-shader is any shader which becomes a component of a Master shader. In other words, the sub-shader is only a part of a completed shader. Used on its own, a sub-shader is a Master shader.

Surface — See Face

That part of a polygon that is not an edge or a vertex. In other words, the main visible area of a polygon.

Surfaces may be internal or external, hidden or visible. You can apply shaders and project images on to surfaces.

Sweep path — See Extrusion

When a two-dimensional shape is extruded, the extrusion does not necessarily have to be at right angles to the shape.

You can define a sweep path to create more complex shapes. For instance, by extruding a circle along a spiral sweep path, you could easily construct a phone cable.

Texture — See Shader

Texture Map

A bitmap (raster) image that is applied to a surface to give it detail.

For instance, you may use a Texture map of a Union Jack to turn a sheet into a flag, or you could use an armour plate texture map on the side of a battle ship to avoid having to manually create every single plate and rivet. The way that Texture maps are applied is determined using a mapping system.

TIFF — See JPEG and BMP

One of the most popular, non-lossy, cross-platform bit-map image formats. Capable of storing at least 32-bits of information per pixel. Sub-varieties offer compression, but even so, TIFF files are among the largest of all file formats.

Tiling

The process of repeating a pattern or shape across an area. Rows may be perfectly aligned with each other, like floor tiles, or offset, like bricks in a wall.

Track — See Pan and Dolly

Some packages use a film making analogy to describe the movement of cameras within your scene.

Tracking is the process of moving the camera in a single plane at right angles to the area of interest. It's ideal for tracking motion in a single plane, such as a person running.

Translucence

The property of a surface to allow light to pass through it.

Translation — See Extrusion, Pipeline and Sweep Path

Translation refers to any change of an object's position or orientation.

It is also a form of extrusion where the cross-section remains at a constant angle, regardless of the angle of the sweep path.

Tweener — See Tweening and Key Frame

The formula used to calculate movement between key frames.

Universe — See Global

View AKA Point of View, Viewpoint

The position from which you view a scene.

Viewpoint — See View

Wire Frame — See Shading

A method of shading an object that uses a simple grid of lines to represent the basic contours of the shape.

This is one graphic designers' favoured methods of working in 3D because it enables you to see between the lines to faces and surfaces that would otherwise be hidden.

Some programs offer a lighted or shaded wire frame view, in which a scene's lighting and an object's basic surface colour information is applied to the wire frame mesh to aid recognition.

Yaw AKA Bank — See Orientation

One of the three values (pitch, roll and yaw) that describes an object's orientation.

Yaw describes the object's rotation around its Z-axis (its left and right tilt). Most systems use a value of 0 degrees at the top (12 o'clock), so banking an object 180 degrees turns it upside down.

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Subscriptions – page 60 / 61
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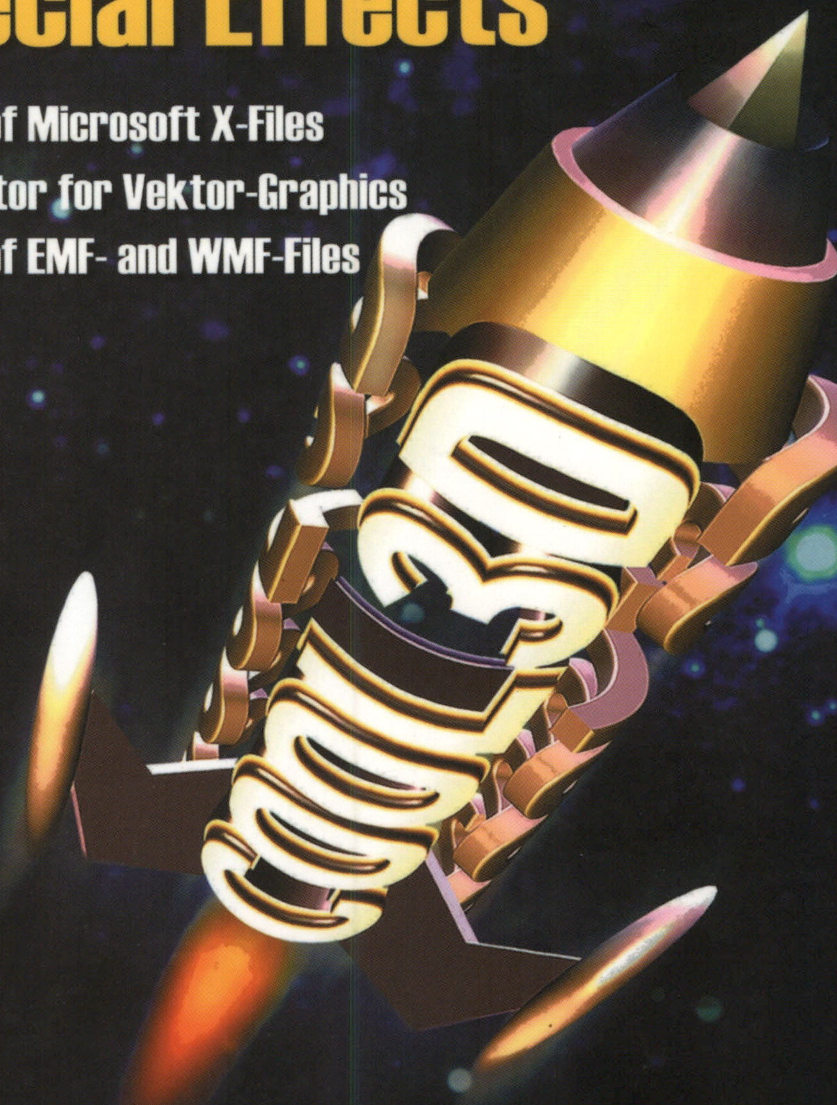

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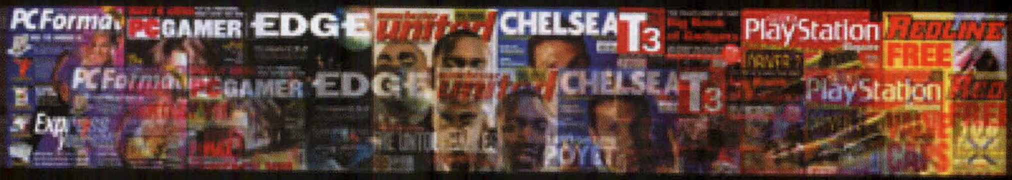

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